Appendix A – Engineering

Annexes B - D

ANNEX B-1. DRAFT VALUE ENGINEERING REPORT

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U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT

CENTRAL EVERGLADES PLANNING PROJECT
FEASIBILITY PHASE

VALUE ENGINEERING STUDY REPORT

February 2013

DOD SERVICE: USACE **VALUE ENGINEERING OFFICER:** Jimmy Matthews, PE, CVS
CONTROL NO: CESAJ-VE-2013-001C

VALUE ENGINEERING STUDY INFORMATION

VALUE ENGINEERING FIRM: U. S. Army Corps of Engineers
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VALUE ENGINEERING WORKSHOP CONDUCTED: 4-8 February 2013

VALUE ENGINEERING STUDY TEAM LEADERS: Frank Vicidomina, CVS and Jimmy Matthews, PE, CVS

VALUE ENGINEERING STUDY TEAM MEMBERS: Team member names and contact information are listed in Appendix B.

POINTS OF CONTACT

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STUDY RESULTS:

Evidence of Unfettered Creativity: 68 Ideas Were Generated During the Workshop

Study Recommendations: 24 Recommendations Were Developed for Consideration

Table of Contents

INTRODUCTION 4

PROJECT DESCRIPTION 4

SUMMARY OF RECOMMENDATIONS 7

VALUE ENGINEERING RECOMMENDATIONS 10

APPENDIX A: VALUE ENGINEERING JOB PLAN AND WORKSHOP AGENDA 44

APPENDIX B: WORKSHOP PARTICIPANT ROSTER 51

APPENDIX C: COST AND SCHEDULE RISK ANALYSIS MODERATE AND HIGH RISK ITEMS 54

APPENDIX D: PROJECT FUNCTIONS BY AREA 57

APPENDIX E: SPECULATION AND EVALUATION LISTS 63

APPENDIX F: TENTATIVELY SELECTED PLAN PROJECT FEATURES ON DATE OF WORKSHOP 68

INTRODUCTION

This report contains the results of the Value Engineering (VE) portion of a combined Cost and Schedule Risk Analysis (CSRA) and VE Workshop that was performed February 4 – 8, 2013 at the USACE Jacksonville District Office (see **Appendix A** – Value Engineering Job Plan and Workshop Agenda). The objective of this workshop was to incorporate VE analysis into the development of project measures and solution alternatives with focus on project functions and selected issues identified as part of the CSRA. This effort resulted in recommendations that can improve project performance, implementation and/or avoid initial or future costs.

At the time of this VE study the project was in Feasibility Phase evaluation with current identification of a Tentatively Selected Plan (TSP). VE recommendations address further planning project features and aspects as well as items that should be considered in future project design.

The CSRA/VE Team was comprised of cost engineers from the Walla Walla District and members of the Project Delivery Team (PDT) that included staff of local sponsors, state and local agencies. 'Net-Meeting' and teleconference means were employed to execute the workshop. A roster of workshop participants can be found in **Appendix B**.

As part of the CSRA cost and schedule risks were identified and classified as low, moderate or high risk/consequence potential. A summary list of moderate and high risk items are shown in **Appendix C**. VE workshop activity included particular focus on developing possible measures that may reduce probability and/or consequence of these items.

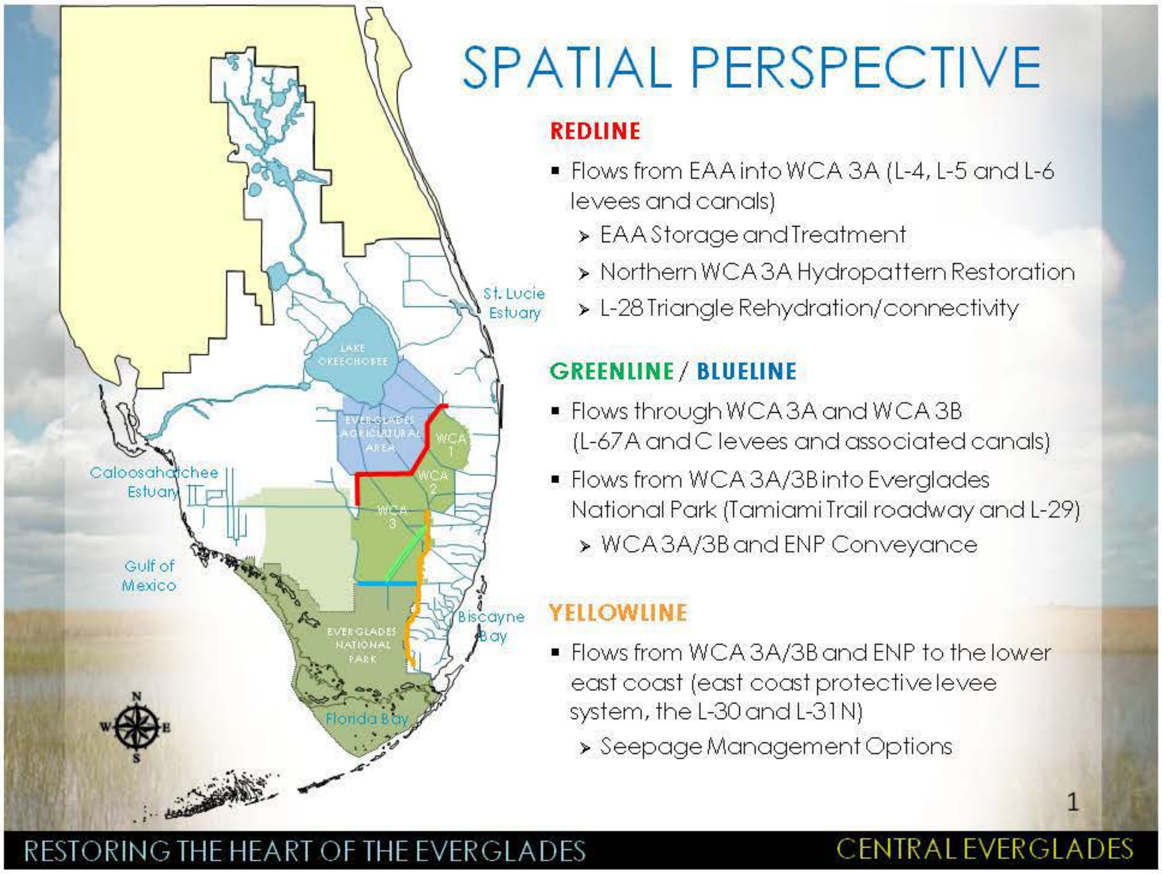
The VE process also identified and addressed project and project feature functions and developed a number of recommendations that may accomplish such functions with either improved performance and/or cost-effectiveness. Project functions are shown for each feature area (reference project description below) as **Appendix D**.

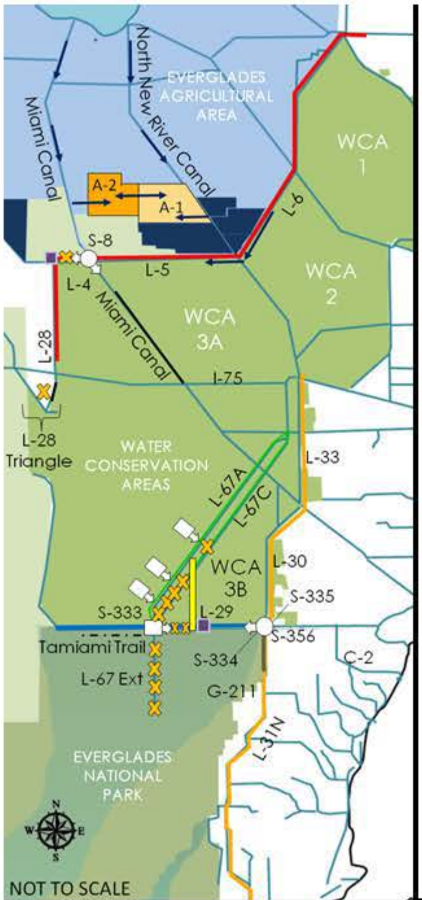
The VE process included 'brainstorming' sessions to produce ideas to mitigate risk, improve the project and reduce cost. These 'raw' ideas were screened and selected for further development or designated as either already being considered in the project or not feasible. **Appendix E** lists all ideas per project area (Speculation Lists) categorized by their disposition (developed or not developed).

PROJECT DESCRIPTION

The Central Everglades Planning Project (CEPP) encompasses the Northern Estuaries (St. Lucie River and Indian River Lagoon and the Caloosahatchee River and Estuary), Lake Okeechobee, a portion of the Everglades Agricultural Area, the Water Conservation Areas; Everglades National Park, the Southern Estuaries (Florida Bay and Biscayne Bay), and the Lower East Coast (see below Spatial Perspective map). The purpose of the CEPP is to improve the quantity, quality, timing and distribution of water flows to the central Everglades.

The project study area has been divided into reaches as follows: North of Redline, South of Redline, Greenline / Blueline and Yellowline. As indicated above, the planning process has recently completed identification of a TSP (see Tentatively Selected Plan map below) . Project features include, but are not limited to, storage and treatment retention basins, canal modifications (plugging and re-routing), removal of existing levees, new levees, flow control structure, pump stations and seepage barriers. Preliminary project cost is estimated at $1.3 billion. Additional TSP feature information is included as **Appendix F**.





TENTATIVELY SELECTED PLAN

STORAGE AND TREATMENT

- Construct A-2 FEB and integrate with A-1 FEB operations
- Lake Okeechobee operation refinements within LORS

DISTRIBUTION/CONVEYANCE

- Diversion of L-6 flows, Infrastructure and L-5 canal improvements
- Remove western ~2.9 miles of L-4 levee (west of S-8 3,000 cfs capacity)
- Divide structure at western terminus of L-4 levee removal
- Backfill Miami Canal and Spoil Mound Removal ~1.5 miles south of S-8 to I-75
- L-28 Triangle – levee gap and canal backfill (~ 9,000 LF)

DISTRIBUTION/CONVEYANCE

- Increase S-333 capacity to 2,500 cfs
- Two 500 cfs gated structures in L-67A, 0.5 mile spoil removal west of L-67A canal north and south of structures
- Construct ~8.5 mile levee in WCA 3B, connecting L-67A to L-29
- Remove ~8 miles of L-67C levee in Blue Shanty flowway (no canal back fill)
- One 500 cfs gated structure north of Blue Shanty levee and 6,000-ft gap in L-67C levee
- Remove ~4.3 miles of L-29 levee in Blue Shanty flowway, divide structure east of Blue Shanty levee at terminus of western bridge
- Tamiami Trail western 2.6 mile bridge and L-29 canal max stage at 9.7 ft (FUTURE WORK BY OTHERS)
- Remove entire 5.5 miles L-67 Extension levee, backfill L-67 Extension canal
- Remove ~6 mile Old Tamiami Trail road (from L-67 Ext to Tram Rd)

SEEPAGE MANAGEMENT

- Increase S-356 pump station to ~1,000 cfs
- Partial depth seepage barrier south of Tamiami Trail (along L-31N)
- G-211 operational refinements; use coastal canals to convey seepage

Note: System wide operational changes and adaptive management considerations will be include in project

FEB | STA | Pump | Old Tamiami Trail Removal | Backfill | Levee Removal | Gated Structure | Seepage Barrier | Divide | Levee

1

SUMMARY OF RECOMMENDATIONS

Results of the workshop include recommendations that can reduce cost or schedule risk, improve performance and/or reduce project life-cycle cost. Recommendations address current report development, future project design or adaptive management activities. Items are grouped per the above four reach designations plus an additional category that pertains to the overall project.

The below list of VE Recommendations are further developed in the following section of this report and are summarized per project area as described in the above project information sections. The following also contains the disposition as decided in the VE Workshop Out Brief.

North of Redline

NR-1. Add outflow gravity structure on SE corner of A-2 - *Address recommendation in project design phase.*

NR-2. Add in-line structure for North New River Canal - *Address recommendation in both current plan development and project design phase.*

NR-3. Increase DS-8 gate capacity from 1,500 to 3,750 cfs to maintain existing drainage flowrate and water elevation - *Address recommendation in current plan development.*

South of Redline

SR-1. Add AM strategy for G-336G (L6 Diversion) - *Address recommendation in both current plan development and development of the adaptive management activities.*

SR-2. Increase S-8 existing pump station horsepower and/or add supplemental exterior type pump unit(s) in lieu of constructing a new pump station - *Address recommendation in project design phase.*

SR-3. Add new pump station (S-8) - *Address recommendation in project design phase.*

SR-4. Integrate and optimize S-8 and G-404 system - *Address recommendation in both current plan development and project design phase.*

SR-5. Re-visit USFWS/FWC Draft Ecological Guidelines for Water Management in WCA-2A – *Address recommendation in development of adaptive management activities.*

Greenline and Blueline

GB-1. Consider partial removal of the remaining length of the L-67 Extension Levee and/or system; also consider only partial removal of Old Tamiami Trail - *Address recommendation in development of adaptive management activities.*

GB-2. Consider extending S-355B collector canal - *Address recommendation in both current plan development and development of the adaptive management activities*

GB-3. Modify the ag canals in flowway - *Address recommendation in both current plan development and development of the adaptive management activities*

GB-4. Use vegetation management to reduce vegetative resistance to water flow downstream of L-67A new structures S-345D & G - *Address recommendation in development of the adaptive management activities*

GB-5. Retrofit DPM structure (S-152 800 cfs 10 - 60" HDPE barrels); Use DPM structure for interim period - *Address recommendation in both project design phase and development of the adaptive management activities*

GB-6. Re-visit L-29 gated divide structure to determine actual flow need and gate flow size - *Address recommendation in both current plan development and development of the adaptive management activities*

GB-7. Optimize operations at most northern structure into WCA 3B (consider for other control structures) - *Address recommendation in development of the adaptive management activities*

Yellowline

Y-1. Determine new S-356 pump station capacity based on functional risk; do not design for both full contingency and unit redundancy - *Address recommendation in both current plan development and project design phase.*

Y-2. For S-356, eliminate redundant pump but incorporate possible future expansion - *Address recommendation in project design phase.*

Y-3. Defer construction of new S-356 pump station until adjacent seepage wall is constructed and system tested; further utilize existing S-356 temporary pump station - *Address recommendation in current plan development, project design phase and in development of the adaptive management activities.*

Y-4. Phase implementation of seepage control features; use AM to determine path - *Address recommendation in development of the adaptive management activities.*

Y-5. Change the location L31N Seepage Management Pilot Project (SMPP) to the location which was the original location contained in the authorized decision document; use CEPP to increase the 902 Limit for

L31N SMPP and install the L31N SMPP to remove project uncertainties - *Address recommendation in current plan development.*

Y-6. Investigate alternative seepage barrier cutoff wall means (such as vinyl sheet pile) - *Address recommendation in project design phase.*

General Topic Considerations

GC-1. Create environmental friendly conveyance channels where opportunity exits - *Address recommendation in both current plan development and project design phase.*

GC-2. Coordinate vegetation management to achieve multiple objectives - *Address recommendation in development of adaptive management activities.*

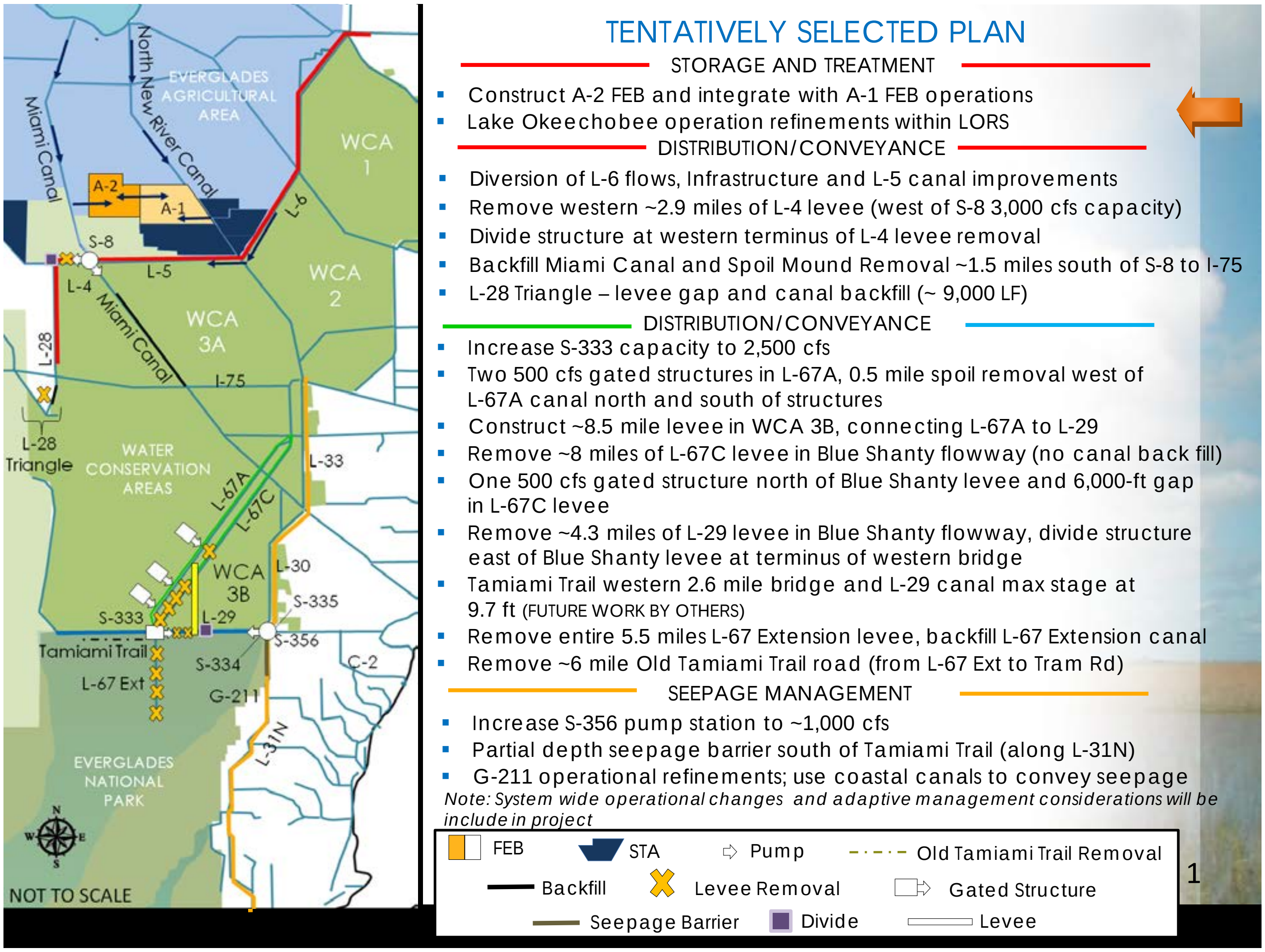
GC-3. Optimize pump station design - *Address recommendation in project design phase.*

VALUE ENGINEERING RECOMMENDATIONS

(The following recommendations were developed in a very short period of time and are intended to present conceptual measures for consideration. Further evaluation and design is required to substantiate each recommendation and provide rationale for its implementation or rejection. Also, a number of recommendations may 'conflict' with others. That is to say that one idea cannot be implemented with the other.

No decision as to preference was made by the VE Team and all options are presented for further consideration by the PDT. However, as part of the out-briefing meeting the PDT established a preliminary disposition for each recommendation. Items are noted as to what phase of project development that it will be further evaluated – Current Repor Development, Project Preconstruction Engineering and Design Phase or Adaptive Management Activities for the Report or RECOVER.)

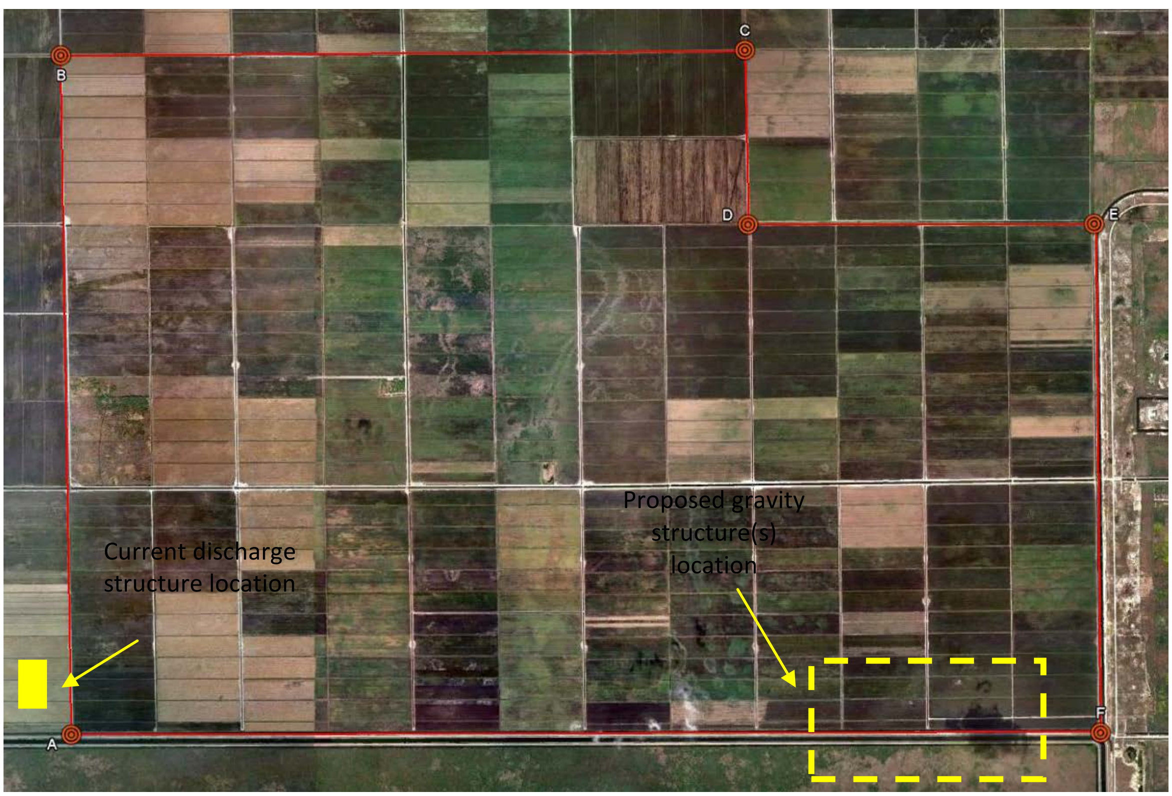
NORTH OF REDLINE



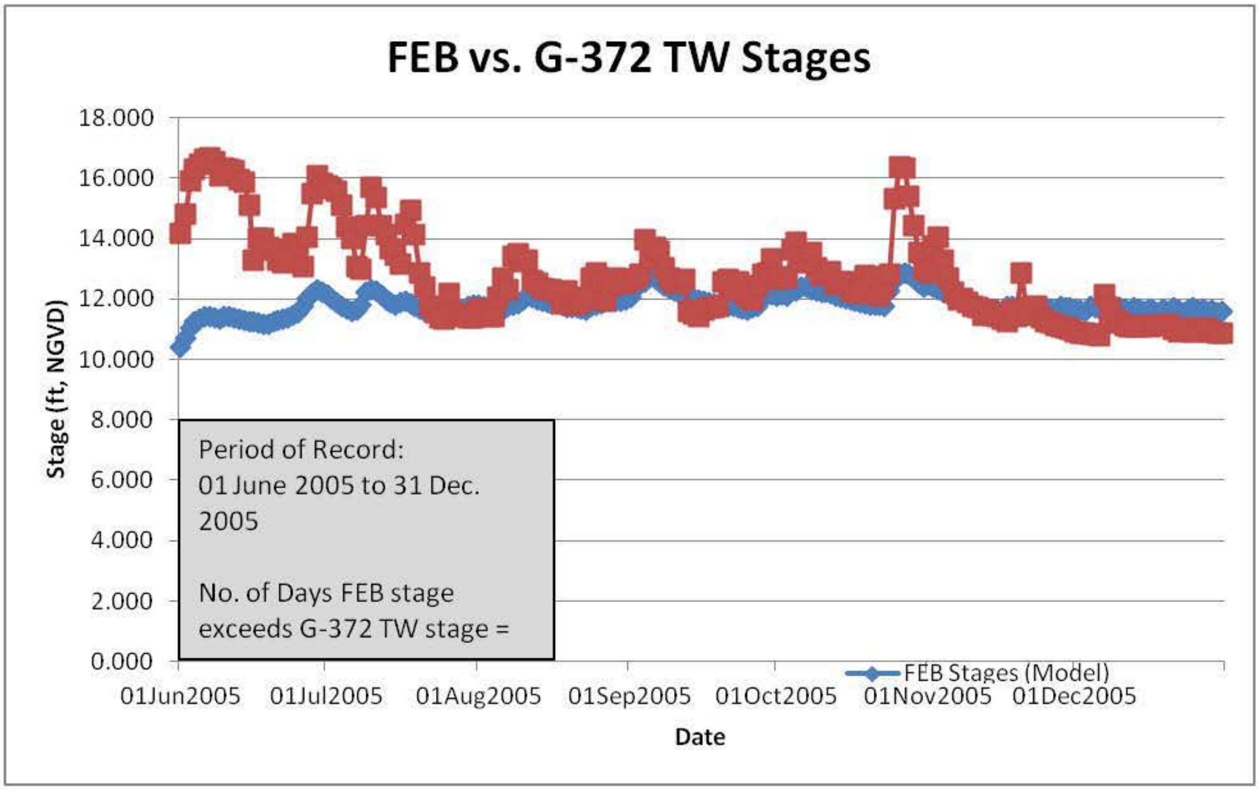
NR-1 Add outflow gravity structure on SE corner of A-2 - The currently proposed design of the A-2 FEB has one outflow structure, DS-7, located on the western perimeter discharging via an outflow canal to the headwaters of G-372. G-372 will be responsible for providing the lift to convey the discharges through the STA 3/4 Supply Canal toward the STA 3/4 inflow structures. A recommendation was made to place gravity outflow structures along the southeast corner of A-2 (see map below). This would be possible as long as the stages in STA 3/4 Supply Canal were low enough for water to pass from the FEB (max stage of 13.0 NGVD – natural grade at 9.0 NGVD with 4 ft depth). The STA 3/4 Supply Canal design stages for HW (G-372 TW) and TW (STA 3/4 Inflow structures HW) are 17.0 NGVD and 15.0 NGVD, respectively.

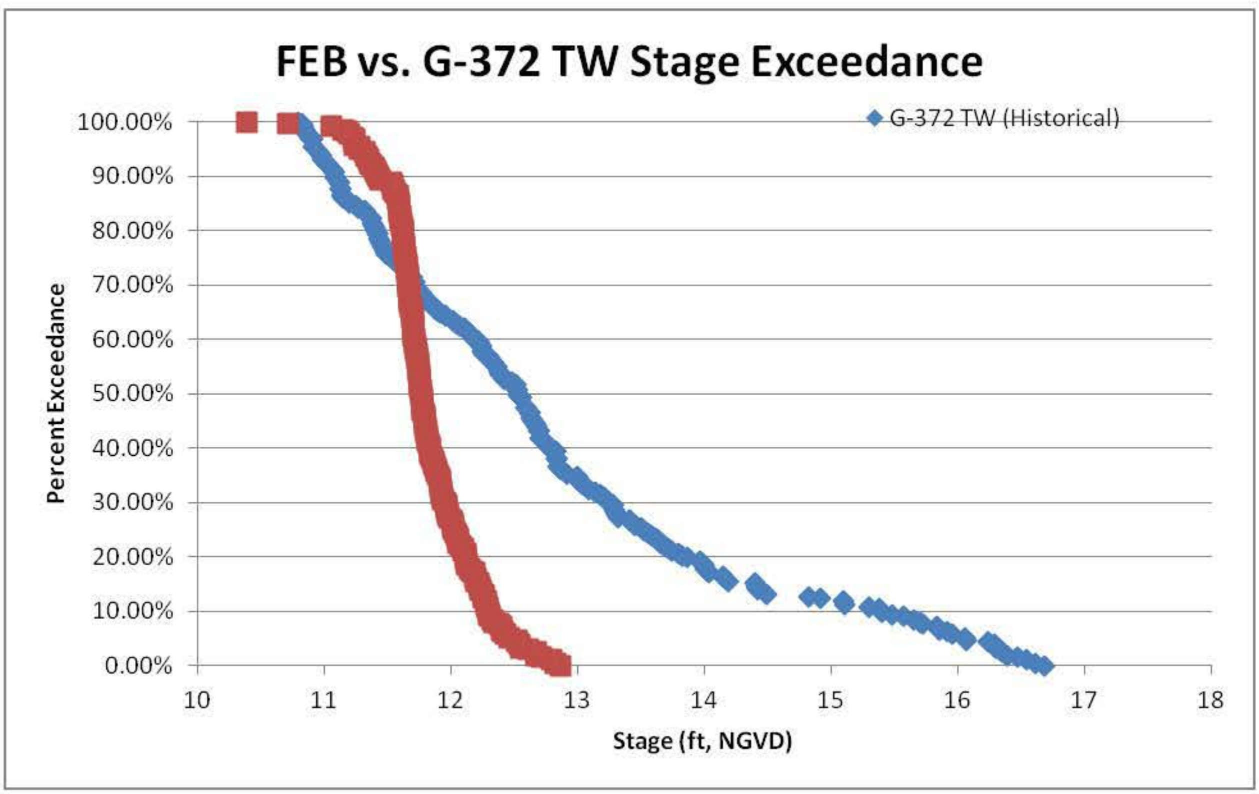
Using the same period of record (01-June-05 to 31-Dec-05) to compare historical G-372 TW stages and modeled FEB stages, data shows that FEB stages exceed G-372 TW stages on average 0.42 ft for a total of 68 days out of 214 days (31.78%). If the proposal is adopted, structures would most likely be culverts with flap gates (reference below graphs).

Preliminary disposition: *Address recommendation in project design phase.*



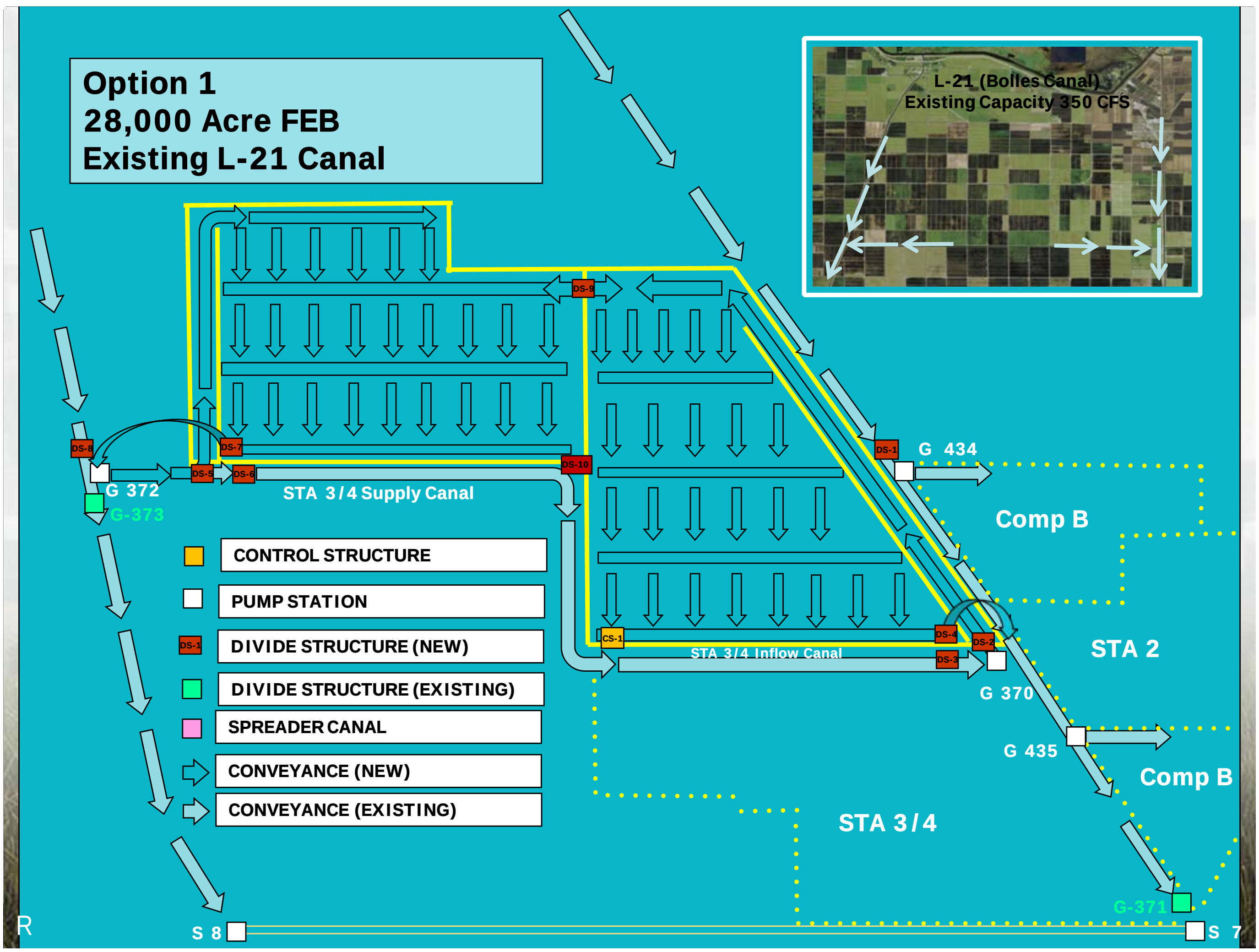
A-2 FEB Location Map


FEB vs. G-372 TW Stages
18.000
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
Stage (ft, NGVD)
Period of Record:
01 June 2005 to 31 Dec. 2005
No. of Days FEB stage exceeds G-372 TW stage =
FEB Stages (Model)
01Jun2005
01Jul2005
01Aug2005
01Sep2005
01Oct2005
01Nov2005
01Dec2005
Date


FEB vs. G-372 TW Stage Exceedance
G-372 TW (Historical)
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Exceedance
10
11
12
13
14
15
16
17
18
Stage (ft, NGVD)

NR-2 Add in-line structure for North New River Canal - The structure in the North New River Canal is an in-line structure that would be located just north of Compartment B, upstream of Pump Station G-434. (See DS-1 in Figure below.) It would allow water from the A1 and A2 FEB's to be discharged into the North New River Canal without mixing with untreated water. At that point, treated water could either be pumped into Compartment B or STA 3/4 for further treatment. Initial modeling results indicate that DS-1 may not be needed for A1 to function, but further modeling and design of the A-1/A-2 FEB combination may indicate that DS-1 is needed.

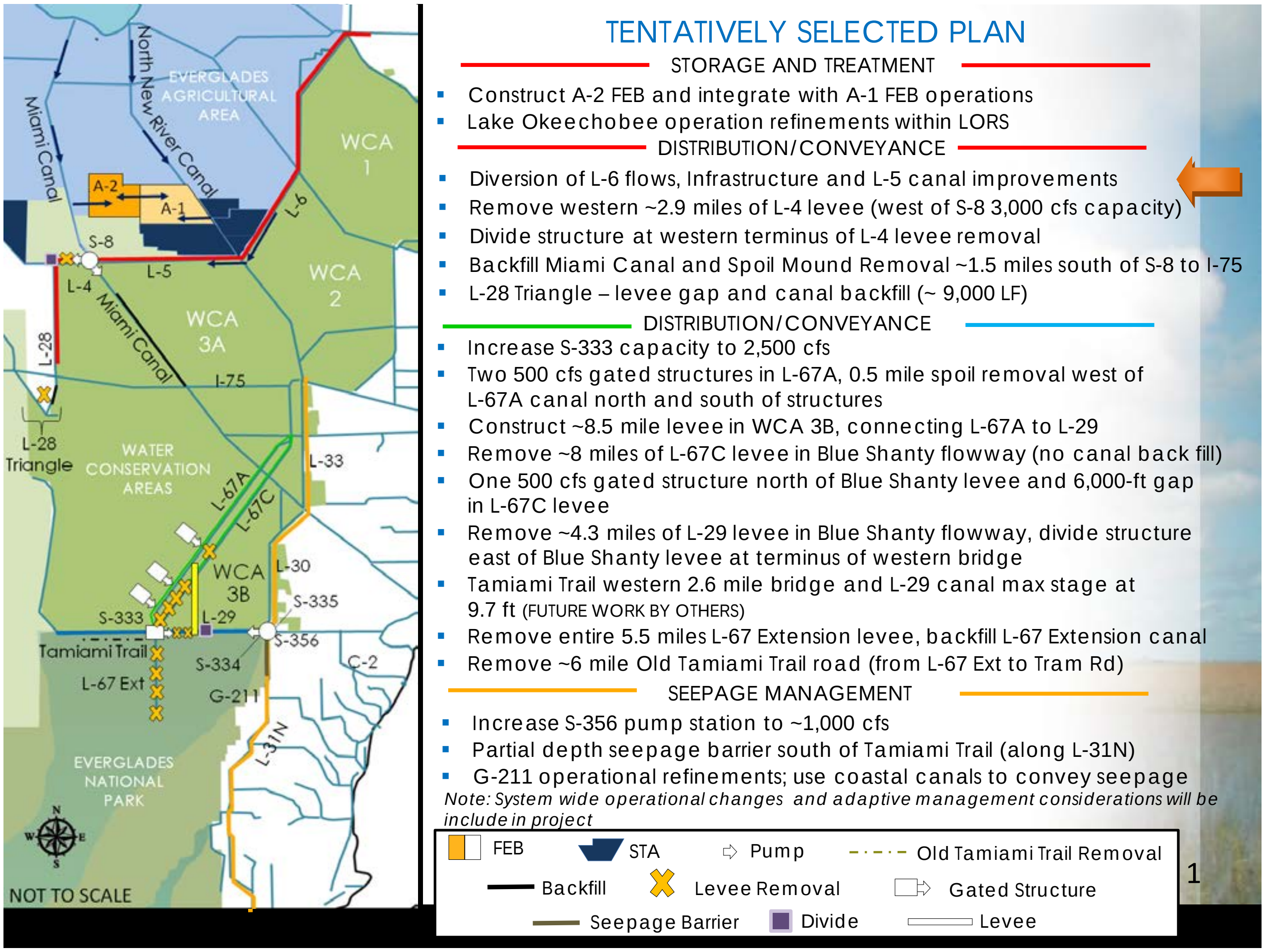
Preliminary disposition: *Address recommendation in both current plan development and project design phase.*



NR-3 Increase **DS-8** ***gate capacity from 1,500 to 3,750 cfs to maintain existing drainage flowrate and water elevation –*** The current design of proposed flow control gated structure DS-8 should be increased to accommodate stormwater flow and designed such that no water level increase is experienced in the drainage area.

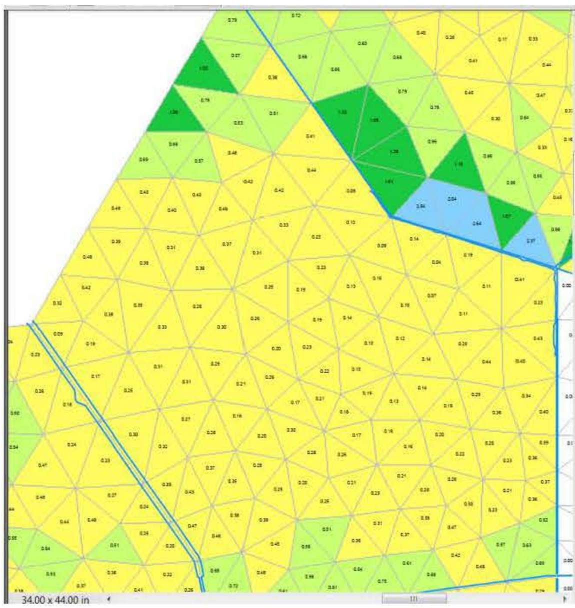
Preliminary disposition: *Address recommendation in current plan development.*

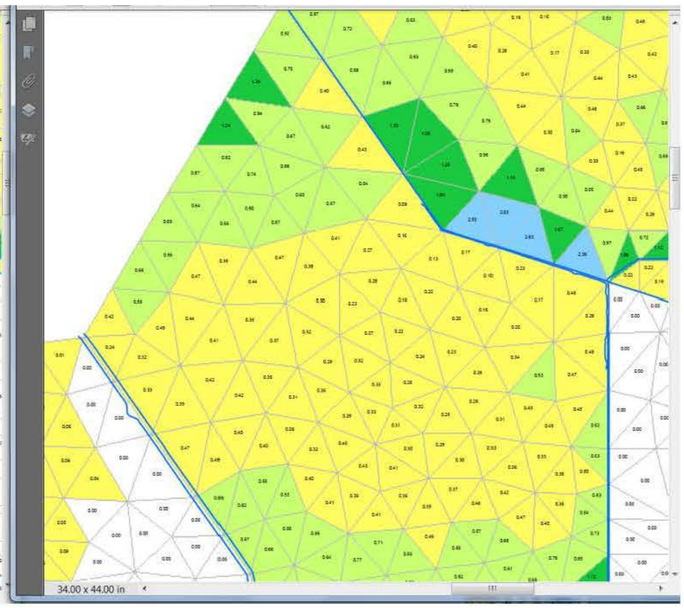
SOUTH OF REDLINE



SR-1 Add AM strategy for G-336G (L6 Diversion) - As part of the CEPP TSP, L-6 diversions of STA treated water that normally would go to WCA 2A would be routed to the L-5/L-4 canals for distribution in WCA 3A. This results in unintended consequences to lowering WCA 2A (see ponding figure in dry season below) and can result in risk of dryouts and fires beyond what it currently experiences. G-336G (see pictures below) is a structure along the L-6 levee in between the EAA and WCA 2A that could potentially be used or retrofitted to help add water during dry periods to avoid drying out of WCA 2A beyond the existing conditions. The structure needs to be examined to determine whether it is controllable to move water northeast or and southwest over a variety of conditions in the canal.

Preliminary disposition: *Address recommendation in both current plan development and development of the Adaptive Management Plan.*


34.00 x 44.00 in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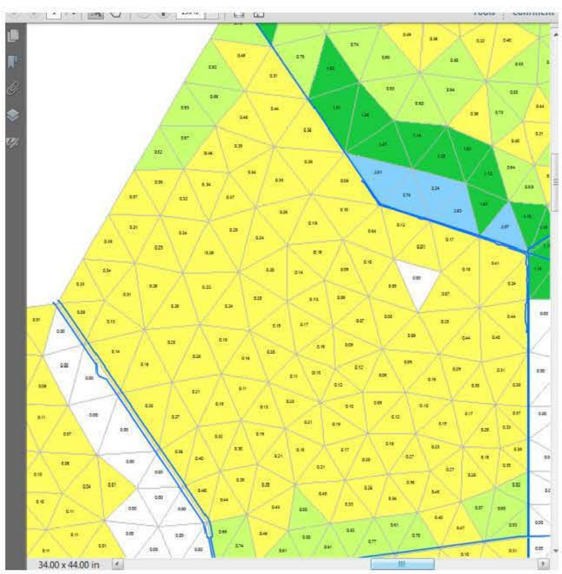

34.00 x 44.00 in

<u>SR-2 Increase S-8 existing pump station horsepower and/or add supplemental exterior type pump unit(s) in lieu of constructing a new pump station –</u> Discharge water elevations will be increased by the project. Such added head may significantly diminish (or even completely negate) existing pumping capacity from S-8. Full capacity must be maintained therefore some form of upgrade is necessary. In lieu of installing a completely new pump station, increasing pump drive horsepower with or without a supplemental exterior type pump should be considered. Added power may be all that is needed to maintain flowrate at increased head conditions. If added power still falls short, but keeps the existing pumps operating but at a lesser capacity, a supplemental pump 'pod' unit can be added to make up the difference. Added overhead structure should be minimized and an 'exterior' type of pod unit could be installed (reference **Recommendation GC-3** and see below photo of such type of pod units from East Ascension Parish, Louisiana.

Preliminary disposition: *Address recommendation in project design phase.*

SR-3 Add new pump station (S-8) - This idea is to either demolish and replace S-8 or add a new pump station in the area. The Engineering team discussed the S-8 Structure. The pump station is 4080 cfs with four 1020 cfs pumps. The structure is not deteriorating and should not be replaced. The pumps would be replaced per the maintenance schedule. Since a definite 3,000 cfs is not needed to go to the west, the water can be routed through a small canal that would connect Miami Canal to L-5 canal. Two gated structures can be placed one in the Miami Canal and one in the new connector canal to either route flow to the south or west.

Preliminary disposition: *Address recommendation in project design phase.*

SR-4 Integrate and optimize S-8 and G-404 system - S-8 can only pump a minimum of 1020 cfs, if lower flows are desired G-404 can be utilized for flows up to 600 CFS. This would allow for the most flexible system. No preliminary design compromises the G-404 structure or operations.

Preliminary disposition: *Address recommendation in both current plan development and project design phase.*

SR-5 Re-visit USFWS/FWC Draft Ecological Guidelines for Water Management in WCA-2A -

Purpose: To provide ecological targets and draft stage hydrograph (Figure 1) that more closely resembles an environmentally preferred *water management strategy for WCA-2A* (not intended to change the 2A regulation schedule).

1. Dry Season Low Recommended Depth Range (~June 1st): **0.0 – 0.5-ft**
2. Wet Season High Depth (~Oct 1st): Approximately **2.0 – 2.25-ft**
3. January 1 target depth range: ~**1.8-ft**
4. Recession Rate Guidelines (January 1- June 1): **0.05 ft/wk** (snail kite preferred) **– 0.07 ft/wk** (wood stork and state listed wading birds).
5. Ascension Rate Guidelines (June 1 – Oct 1) Maximum of **0.25 ft/week** and approximately **0.05 ft/wk** minimum. Preferred **0.05-0.15-ft**.

Assumption: Ground surface elevation of 10.75-ft NGVD (EDEN Wet Prairie Site 17). Ultimately, WCA-2A will need to join the periodic scientist calls for real-time water management with ecological recommendations for recession rates, ascension rates, and core foraging depths.

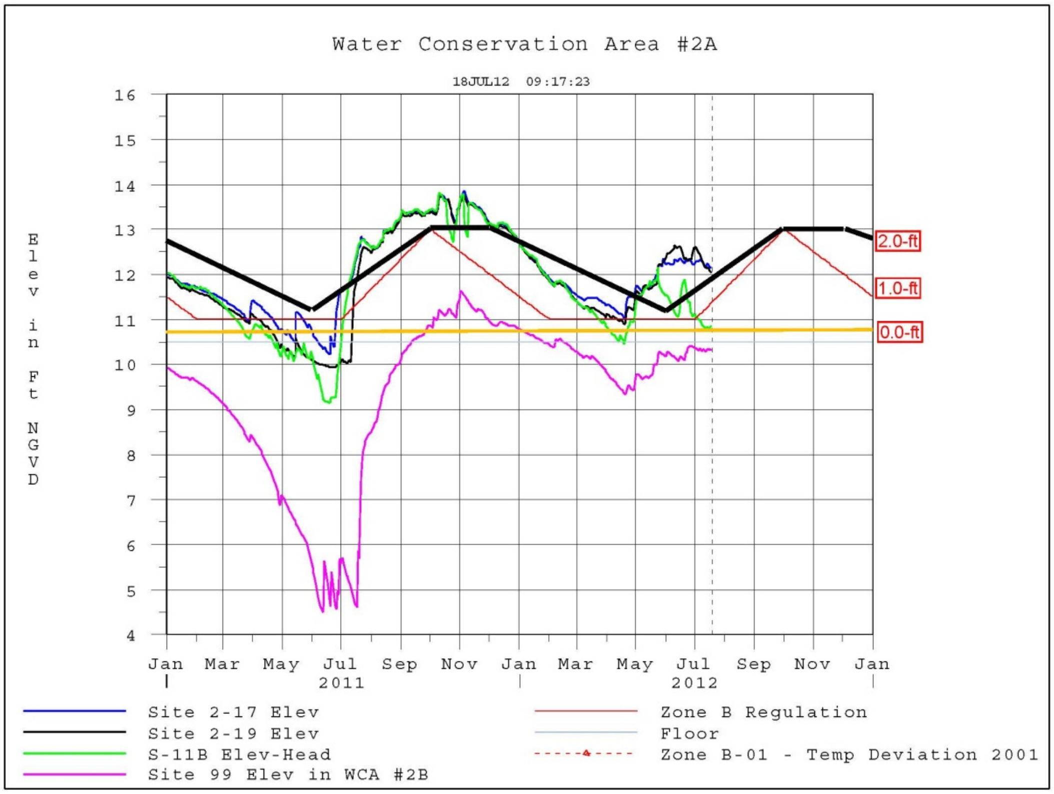
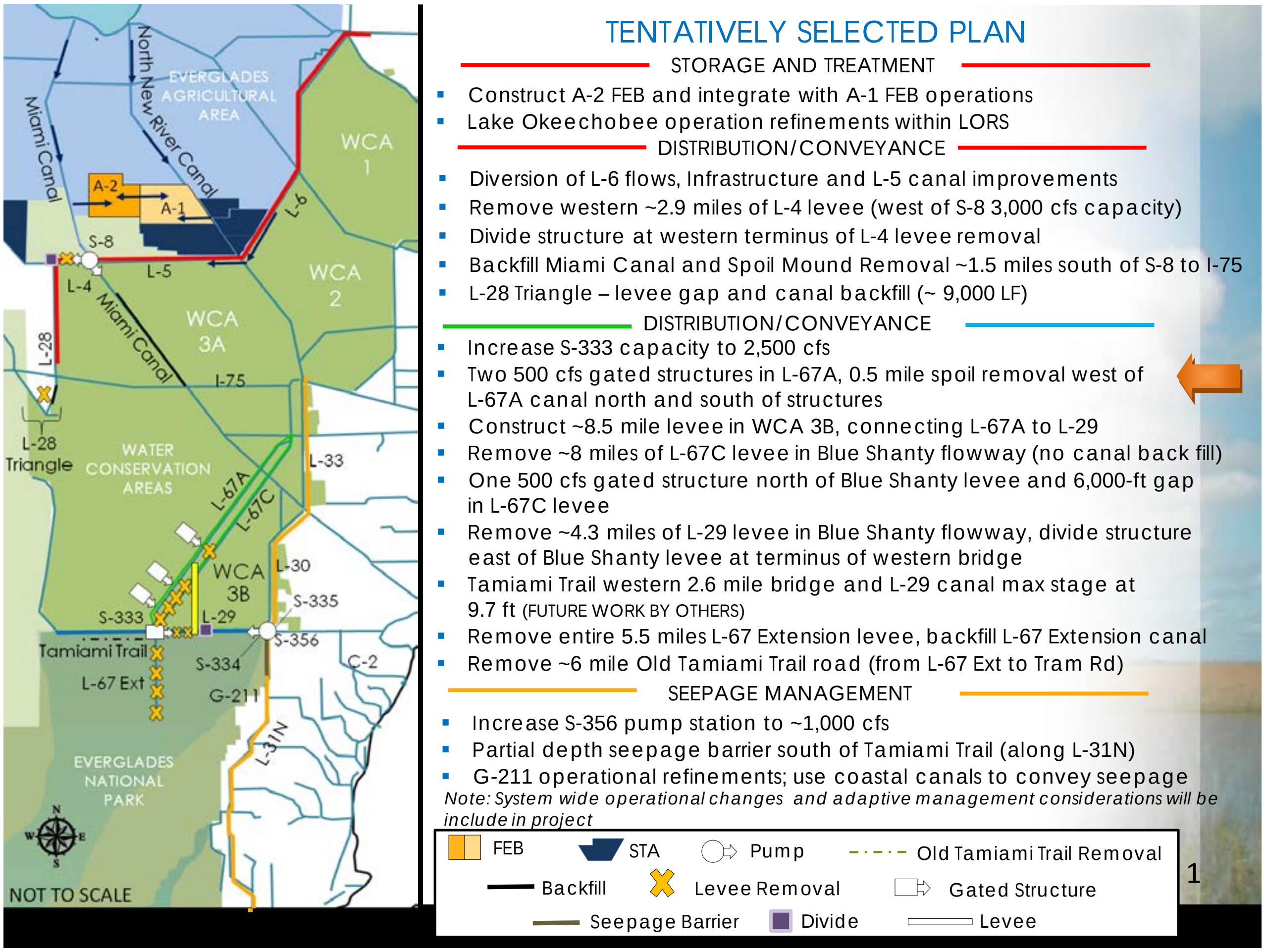


Figure1. Draft targets above represented as black line on existing 2A stage hydrograph (stage in NGVD on y-axis, water depth on x-axis).

Preliminary disposition: *Address recommendation in development of Adaptive Management Plan.*

GREENLINE AND BLUELINE

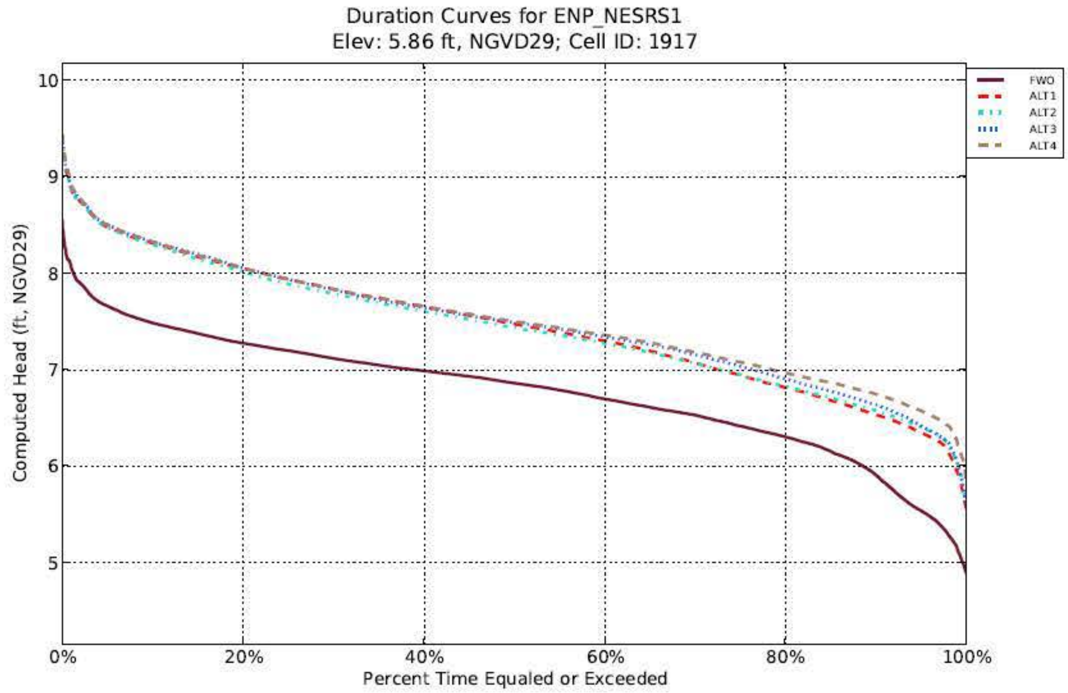


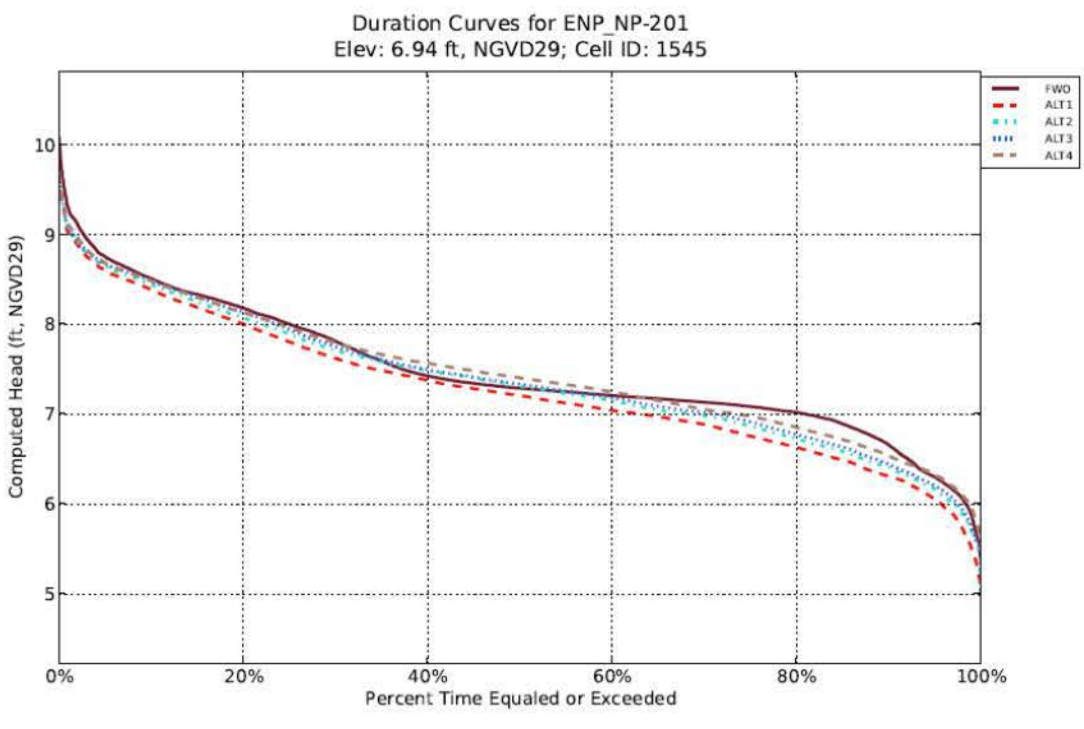
GB-1. Consider partial removal of the remaining length of the L-67 Extension Levee and/or canal system; also consider only partial removal of Old Tamiami Trail - The frequency and duration of high water conditions within WCA-3A must not be increased with implementation of CEPP (compared to ERTP), and the S-12s are the primary regulatory outlets for WCA-3A. Removal of all or portions of the Old Tamiami Trail, between ENP Tram Road and L-67 Extension (~6 miles), provides increased conveyance capacity for the S-12C and S-12D structures from WCA-3A and would enhance the spatial extent of sheetflow within western Shark River Slough (SRS). The CERP plan recommends complete removal of the L-29 Levee, which would require removal of the Old Tamiami Trail roadway to realize benefits. SAJ-EN anticipates that removal of more than ~1.5 miles of the L-67 Extension Canal (with or without adjacent levee removal) is anticipated to significantly reduce the outlet conveyance capacity of the S-12C and S-12D, and would require mitigation of these effects through removal of all or portions of this ~6-mile section of the Old Tamiami Trail. Note that removal of Old Tamiami Trail west of the ENP Tram Road is not included with CEPP due to the location of the Miccosukee Reservation along Tram Road and T&E concerns with releases from S-12A and S-12B.

Option 1: Remove of 1.5 miles of the L-67 Extension Levee and Canal (modeled CEPP Alternative 1). Removal of ~1.5 miles of the L-67 Extension Canal is anticipated to negligibly affect the outlet conveyance capacity of the S-12C and S-12D (previously considered with the MWD Project), and would not likely require mitigation through removal of all or portions of this section of the Old Tamiami Trail. This option would provide reduced hydrologic connectivity between Western SRS and Northeast SRS, as compared to the TSP (although greater than the No Action condition). Depending on the CEPP flow distributions within other parts of the system, which is still being adjusted with ongoing modeling, the stage differential between CEPP Alternative 1 (1.5 mile L-67 Extension removal) and CEPP Alternatives 2-4 (complete L-67 Extension removal) are negligible at NESRS-1 (see Alternative 2) and minor at approximately 0.1-0.2 feet at NP-201 (see accompanying figures). The performance-based TSP selection of Alternative 4 was not critically dependant on the L-67 Extension configuration. Option 1 is also a potential adaptive management increment.

Option 2: Remove most or all of L-67 Extension Levee and do not fill canal (not modeled in CEPP alternatives). This option would provide hydrologic connectivity between Western SRS and Northeast SRS, comparable to the CEPP TSP performance. A modest reduction in the outlet conveyance capacity of the S-12C and S-12D would be expected due to the increased hydrologic interaction between S-333 and the S-12s, although this may be offset with the significant reduced regulatory reliance on the S-12s with CEPP implementation (as modeled). Complete removal of the segment of Old Tamiami Trail would not be required and the L-67 Extension Levee material could be utilized for other CEPP components (i.e. Blue Shanty Levee), potentially with material processing requirements.

Preliminary disposition: *Address recommendation in development of Adaptive Management Plan.*


Duration Curves for ENP_NESRS1
Elev: 5.86 ft, NGVD29; Cell ID: 1917
Computed Head (ft, NGVD29)
Percent Time Equaled or Exceeded
FWO
ALT1
ALT2
ALT3
ALT4
0%
20%
40%
60%
80%
100%
5
6
7
8
9
10


Duration Curves for ENP_NP-201
Elev: 6.94 ft, NGVD29; Cell ID: 1545
Computed Head (ft, NGVD29)
Percent Time Equaled or Exceeded
FWO
ALT1
ALT2
ALT3
ALT4
0%
20%
40%
60%
80%
100%
5
6
7
8
9
10

GB-2. Consider extending S-355B collector canal - Ongoing CEPP TSP adjustments and associated hydrologic modeling have included recommendations to increase stages within eastern WCA-3B, east of the Blue Shanty levee, compared with Alternative 4 stages. The TSP cost estimate included placeholders for potential conveyance improvements within the WCA-3B remnant agricultural ditches, east of the Blue Shanty levee. The conveyance improvements were intended to improve the ability to achieve north-to-south flows from eastern WCA-3B to the L-29 Canal, via the existing S-355A and S-355B gravity spillway structures.

Since the CEPP TSP does not include additional WCA-3B outlet structures for eastern WCA-3B, this proposal would extend the existing 1000 foot upstream collector canal for S-355B by 0.4 miles (~2100 feet) to tie-in with the Central remnant north-south agricultural ditch (with associated conveyance improvements to the Central remnant north-south agricultural ditch and the remnant east-west agricultural ditch), as shown in the below map. By providing a hydrologic connection between the S-355B collector canal and the remnant agricultural ditches, the efficiency and quantity of conveyance from southern WCA-3B to the S-355B will be improved (degree is dependent on operating stages within WCA-3B and design details). Gravity outflow from WCA-3B will remain dependant on managing water levels within WCA-3B higher than stages in the L-29 Canal, east of the proposed CEPP L-29 Divide structure. CEPP stakeholders have expressed concerns with significant increased water management stages within WCA-3B, without providing sufficient WCA-3B outlet capability. Collector canal construction would impact at minimum 7-10 acres of WCA-3B wetlands located along the interior toe of the L-29 Levee, assuming current dimensions of the S-355B collector canal.

The S-355A and associated collector canal is located east of the proposed Blue Shanty levee and 1.7 miles west of the Central remnant north-south agricultural ditch. The Western remnant north-south agricultural ditch is located within the footprint of the proposed Blue Shanty flow-way. The proposed S-355B collector canal extension represents the minimum amount of additional collector canal construction that would improve the capability to utilize the existing S-355s to convey water out of WCA-3B. Construction of a new gravity culvert structure at the southern terminus of the Central remnant north-south agricultural ditch could be considered as an alternative to the extension of the S-355B collector canal. These options have been previously proposed for consideration during the MWD Project.

Preliminary disposition: *Address recommendation in both current plan development and development of the Adaptive Management Plan*

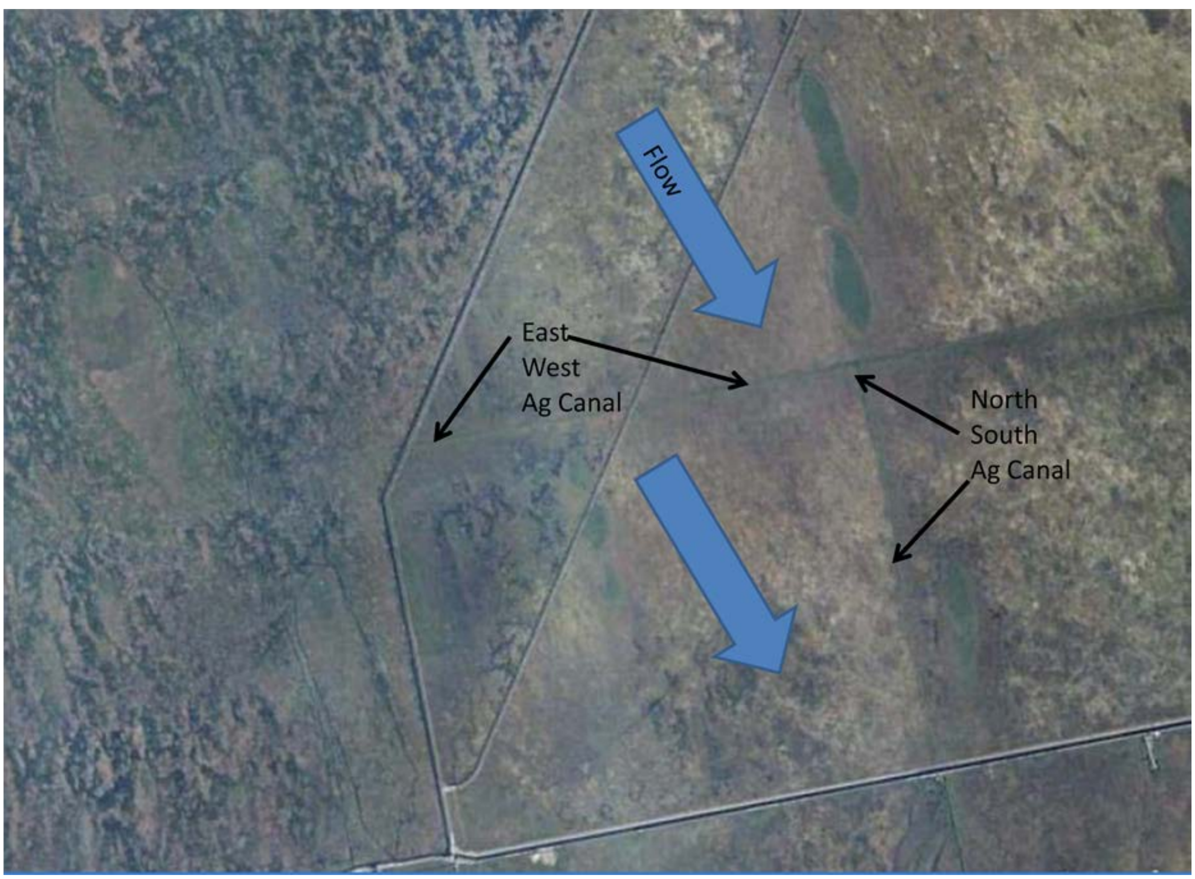

Existing Ag Canals
New Canal Length 2,100 ft
BW 50 ft
Invert 0 ft NGVD
S 355A
S 355B

Alt. A

GB-3. Modify the ag canals in flowway - In southern WCA 3B there are remnant agricultural canals. Within the proposed Blue Shanty Flow way there is one east-west running canal that connects to one north south canal (Blue Shanty Canal). These canals impose a scar on the landscape that can easily be seen from an aerial view (see map below).

The agricultural canals are shallow and heavily vegetated with water lilies and cattails (indicating depths of 3-6 feet). There are mounds along both side of the canals, approximately one-foot higher than adjacent marsh grade. The mounds are heavily vegetated with willows and pond apple. If left in place, the spoil mounds along the canal impose barriers so sheetflow (see flow arrows in figure) when water levels are low. In addition, the north south canal will act as a drainage canal once the Blue Shanty Flowway is constructed. Removing the spoil mounds and backfilling the Blue shanty (north south) canal would improve the project benefit by removing barriers to sheetflow, and would provide water quality benefits by allowing water to flow through the marsh eliminating any short circuiting/drainage trough the north south canal. Additionally, removing the ag canals could help offset some of the environmental impacts from the proposed new levee in WCA 3B.

Preliminary disposition: *Address recommendation in both current plan development and development of the Adaptive Management Plan*



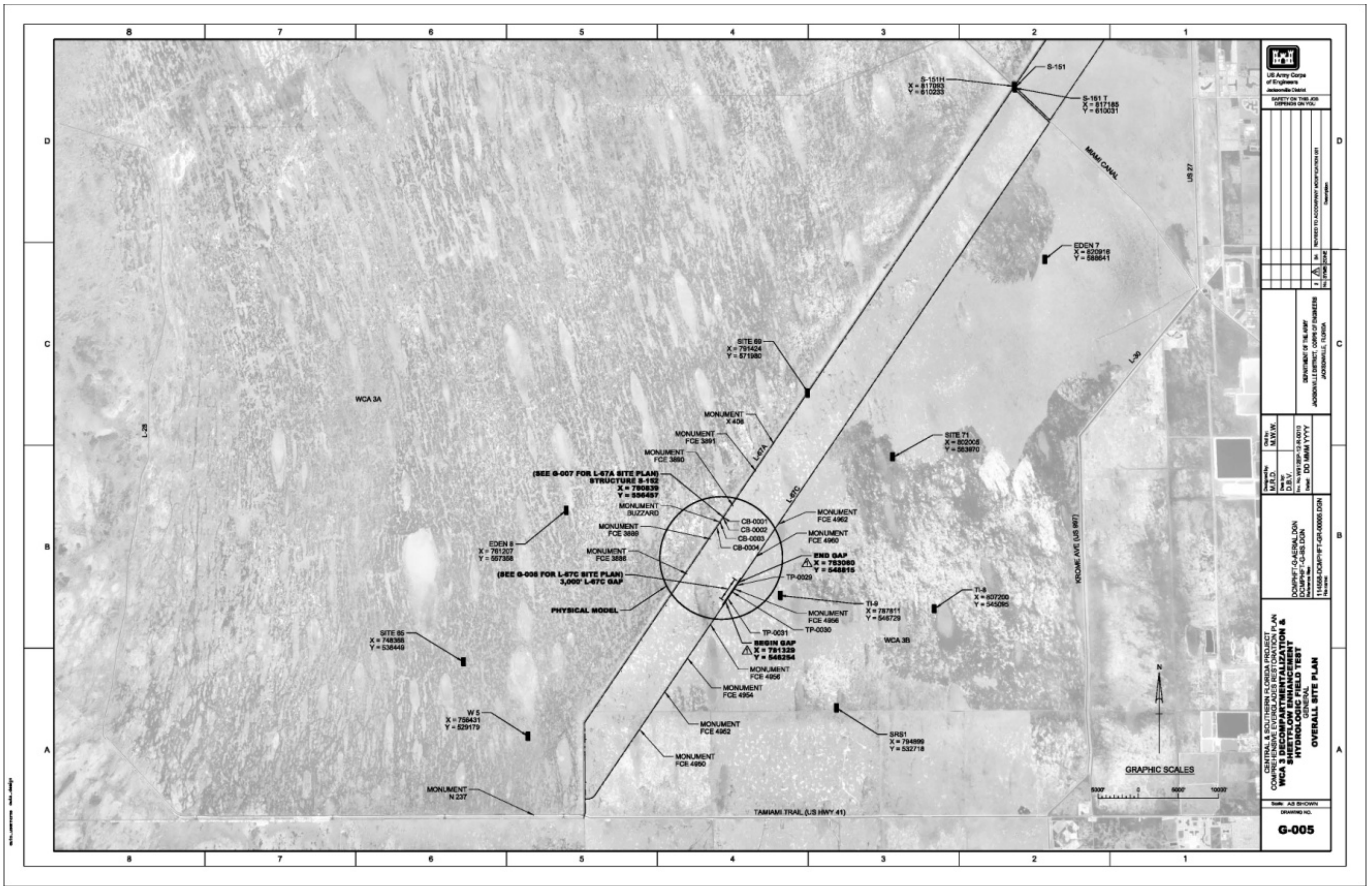
GB-4. Use vegetation management to reduce vegetative resistance to water flow downstream of L-67A new structures S-345D & G - Much of the vegetation and landscape structure south of L-67 levees in WCA 3B is dense sawgrass without any sloughs. The desired landscape structure is for longer hydroperiods that promote development of a ridge and slough landscape. There is a potential that sheetflow velocities may not be high enough from the L-67 structures to move sheetflow at rates fast enough across the sawgrass plain to get the desired restoration benefits. Sawgrass has a high friction coefficient that slows down velocity, and based on actual implementation, may require specific vegetation management activities to facilitate transition of the landscape to more ridge and sloughs (e.g., herbicide, focused fire during wet season, or other least destructive method).

Preliminary disposition: *Address recommendation in development of the Adaptive Management Plan*

GB-5 Retrofit DPM structure (S-152 800 cfs 10 - 60" HDPE barrels); Use DPM structure for interim period - USACE and SFWMD entered in a design agreement May 12, 2000 for purposes of conducting activities related to planning, engineering and design of CERP projects. The Decomp Physical Model known as DPM project was permitted as a large-scale field test designed to answer uncertainties with depth, hydroperiod, sheetflow and canal backfilling associated with the full-scale CERP DECOMP project. It was designed for a 5 year life cycle to go in place and be removed between 5-10 years as described in the DECOMP DPM Design Test Documentation Report. The DPM contract is scheduled for completion 2013. L-67C 3,000 ft gap was completed in Nov 2012. Plan is to conduct test for 2 years after construction complete for (2 months) of each year. Part of the permitting also conceptually approved de-installation (removal) of S-152, excavation of backfill material from L-67C canal, L-67A and L-67C levee reconstruction and finally removal of temporary access roads and spoil areas (see below drawing).

This VE recommendation proposes to retrofit the existing temporary (S-152 test structure) that was designed within the constraints noted above (design test, temporary nature, easily removable materials after test complete). A second part of this proposal is allow DPM components to remain in place and use it to continue to collect information through CEPP Adaptive Management. PROS – The existing temporary structure can be operated to see how 3B responds and what benefits you will achieve moving existing water through 3B and potentially the proposed flowway. CONS- maintenance responsibilities of the structure and functionality if left in place longer than the 10 year design life concept. It affects material selection as well as potential problems for seepage of the culverts. This idea is something that could merit consideration for the VE Report and further investigation during PED detail design phase.

Preliminary disposition: *Address recommendation in both project design phase and development of the Adaptive Management Plan*



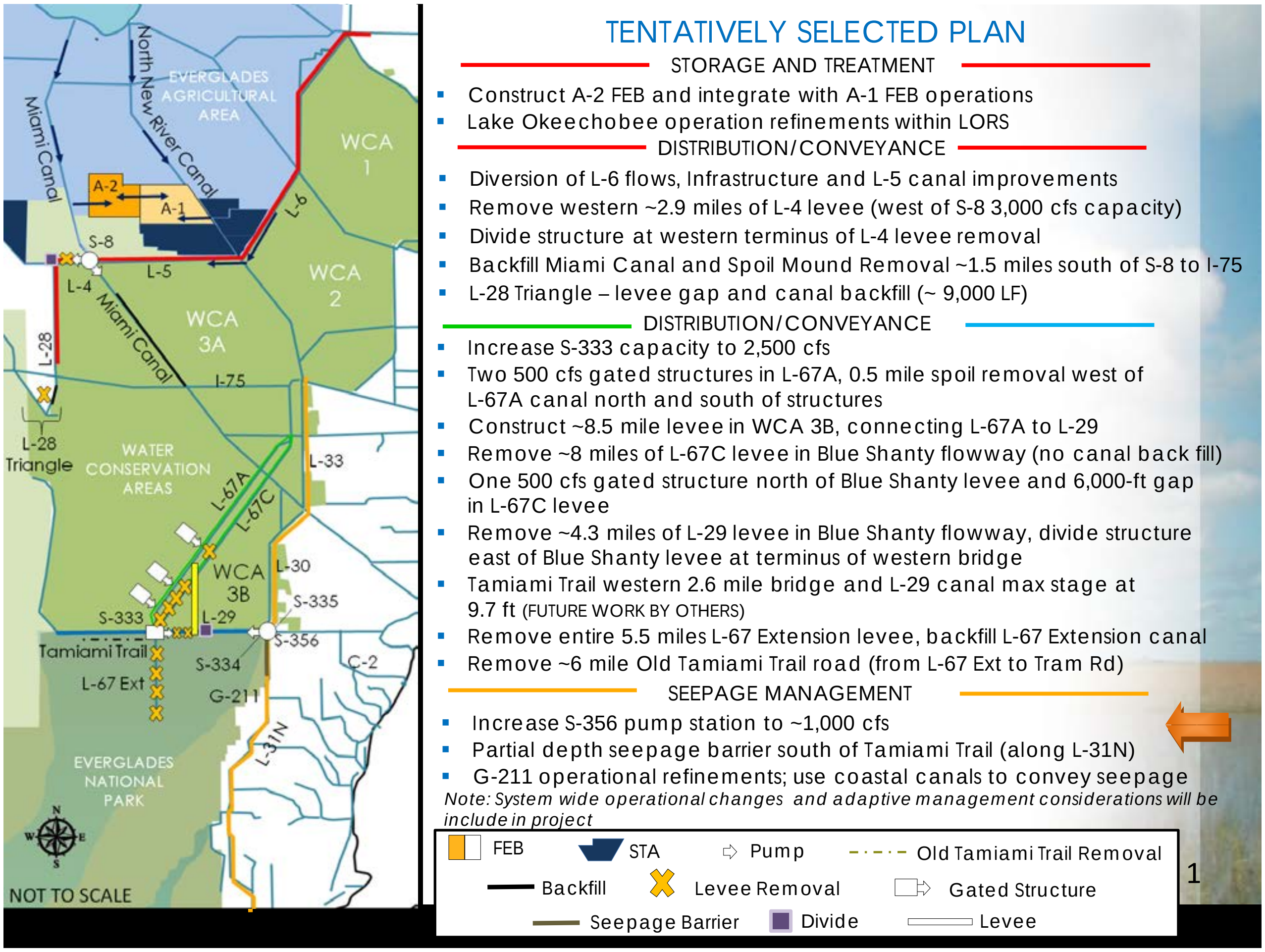
<u>GB-6. Re-visit L-29 gated divider structure to determine actual flow need and gate flow size -</u> The current design flow capacity of the proposed L-29 gated divider structure is reported to be 1,350 cfs. It appears that no stormwater flow accommodation is needed in this location and a reduction in capacity may be possible. In addition to conveyance structure size reduction, lowering the flow rate may allow use of a pipe culvert in lieu of a more expensive concrete box.

Preliminary disposition: *Address recommendation in both current plan development and development of the Adaptive Management Plan*

GB-7. Optimize operations at most northern structure into WCA 3B (consider for other control structures) - Discussions on the optimization of any structure would be dependent on a system-wide analysis of the operations , taking into account the water level regulations, existing and future structures, levees, and gaps, among other things. An individual refinement of operations that haven't been developed would be unable to yield useful information. At this stage, modeling would be required to determine what additional benefits could be obtained. When the operations are developed, each structure and feature's respective operations will be optimized to work together as part of the larger system. Such a structure where this appears to be pertinent is S-345C, the most northern control point of WCA 3B.

Preliminary disposition: *Address recommendation in development of the Adaptive Management Plan*

YELLOWLINE



North New River Canal
EVERGLADES AGRICULTURAL AREA
Miami Canal
WCA 1
A-2
A-1
L-6
S-8
L-5
L-4
WCA 2
WCA 3A
Miami Canal
L-28
I-75
L-28 Triangle
WATER CONSERVATION AREAS
L-67A
L-67C
L-33
WCA 3B
L-30
S-335
S-333
L-29
S-356
Tamiami Trail
S-334
C-2
L-67 Ext
G-211
L-31N
EVERGLADES NATIONAL PARK
NOT TO SCALE
TENTATIVELY SELECTED PLAN
STORAGE AND TREATMENT
Construct A-2 FEB and integrate with A-1 FEB operations
Lake Okeechobee operation refinements within LORS
DISTRIBUTION/CONVEYANCE
Diversion of L-6 flows, Infrastructure and L-5 canal improvements
Remove western ~2.9 miles of L-4 levee (west of S-8 3,000 cfs capacity)
Divide structure at western terminus of L-4 levee removal
Backfill Miami Canal and Spoil Mound Removal ~1.5 miles south of S-8 to I-75
L-28 Triangle – levee gap and canal backfill (~ 9,000 LF)
DISTRIBUTION/CONVEYANCE
Increase S-333 capacity to 2,500 cfs
Two 500 cfs gated structures in L-67A, 0.5 mile spoil removal west of L-67A canal north and south of structures
Construct ~8.5 mile levee in WCA 3B, connecting L-67A to L-29
Remove ~8 miles of L-67C levee in Blue Shanty flowway (no canal back fill)
One 500 cfs gated structure north of Blue Shanty levee and 6,000-ft gap in L-67C levee
Remove ~4.3 miles of L-29 levee in Blue Shanty flowway, divide structure east of Blue Shanty levee at terminus of western bridge
Tamiami Trail western 2.6 mile bridge and L-29 canal max stage at 9.7 ft (FUTURE WORK BY OTHERS)
Remove entire 5.5 miles L-67 Extension levee, backfill L-67 Extension canal
Remove ~6 mile Old Tamiami Trail road (from L-67 Ext to Tram Rd)
SEEPAGE MANAGEMENT
Increase S-356 pump station to ~1,000 cfs
Partial depth seepage barrier south of Tamiami Trail (along L-31N)
G-211 operational refinements; use coastal canals to convey seepage
Note: System wide operational changes and adaptive management considerations will be include in project
FEB
STA
Pump
Old Tamiami Trail Removal
Backfill
Levee Removal
Gated Structure
Seepage Barrier
Divide
Levee
1

Y-1 Determine new S-356 pump station capacity based on functional risk; do not design for both full contingency and unit redundancy – The proposed S-56 pump station is currently slated for 1,000 cfs capacity. This is based on current modeling of anticipated increased seepage flowrate of 750 cfs after completion of the adjacent canal seepage cut-off wall with project induced increased water levels in the Everglades Park (note that further modeling will likely change this value). The added 250 cfs is, for lack of a better term, contingency since seepage flow prediction has a relative degree of uncertainty.

Standard pump station design calls a unit redundancy such that design capacity is met with the largest unit out of operation. While not the same thing, but with some overlapping implicit risk, the above mentioned 'contingency' to some extent duplicates unit redundancy. While this station is indirectly a flood control feature as it will prevent downstream drainage canals from having elevated water levels, some reduction in total station size appears to be warranted given the above mention overlapping components of added reserve capacity.

The opportunity may exist to realize actual seepage flowrate via further use of the existing 500 cfs temporary pump station at this location. This would allow completion of the seepage wall and water delivery features such that seepage conveyance requirements can be measured (see **Recommendation Y-3** below).

Preliminary disposition: *Address recommendation in both current plan development and project design phase.*

Y-2 For S-356, eliminate redundant pump but incorporate possible future expansion –
If some risk is taken in the firm capacity design of S-356 as indicated above, then consideration should be given to the possible need to increase the pump station capacity. Such design features may include but not be limited to:

- Accommodating larger/faster motors such that individual pump unit capacities could be mechanically increased.

- Accommodating station expansion to one side (minimizing impact to ancillary features)

- Acquiring extra land to for possible expansion

Such design considerations would minimize the cost consequences if the new station is initially built with limited capacity.

Preliminary disposition: *Address recommendation in project design phase.*

Y-3 Defer construction of new S-356 pump station until adjacent seepage wall is constructed and system tested; further utilize existing S-356 temporary pump station – The S-356 site has an existing 500 cfs pump station that was installed for temporary service. It appears to be functional and potentially capable of limited continued service with some needed re-habilitation. Should further service form this station be applied, it will be possible to defer installation of the **$45 million** new S-356 station currently planned at 1,000 cfs capacity. This option would call for the construction of the proposed adjacent canal seepage barrier cut-off wall and project purpose water level increase in the Everglades Park. The existing 500 cfs pump station will likely be capable of accommodating most if not all seepage flow and actual pumping needs can be measured (see above recommendation regarding station design flowrate determination – 750 cfs / 1,000 cfs). Note that initial hydration of the Park can be initially controlled until such that pump station capacity is not exceeded.

In addition to the ability to refine design capacity for the new, permanent pump station (possibility of reduced station size and significant cost), two other benefits can be realized:

- First, given no delay in project benefits, the deferral of this $45 million expenditure negates interest lost during construction for the time period of temporary pump utilization (5 – 10-years @ 3.75% or about $8.5 to $17 million).

- ***<u>Second, and more important, is the fact that deferring this expenditure allows placement of other features that will likely produce additional net project benefits in earlier years.</u>***

Implementation of extending service of the temporary station appears to be difficult. Difficulties include, but may not be limited to:

- Expiration of current federal authorization and funding for operation and maintenance

- Ownership and responsibility

- Current litigation regarding discharge water quality (issue for permanent station as well but this option would require faster resolution)

- Physical rehabilitation of the station to facilitate continued use

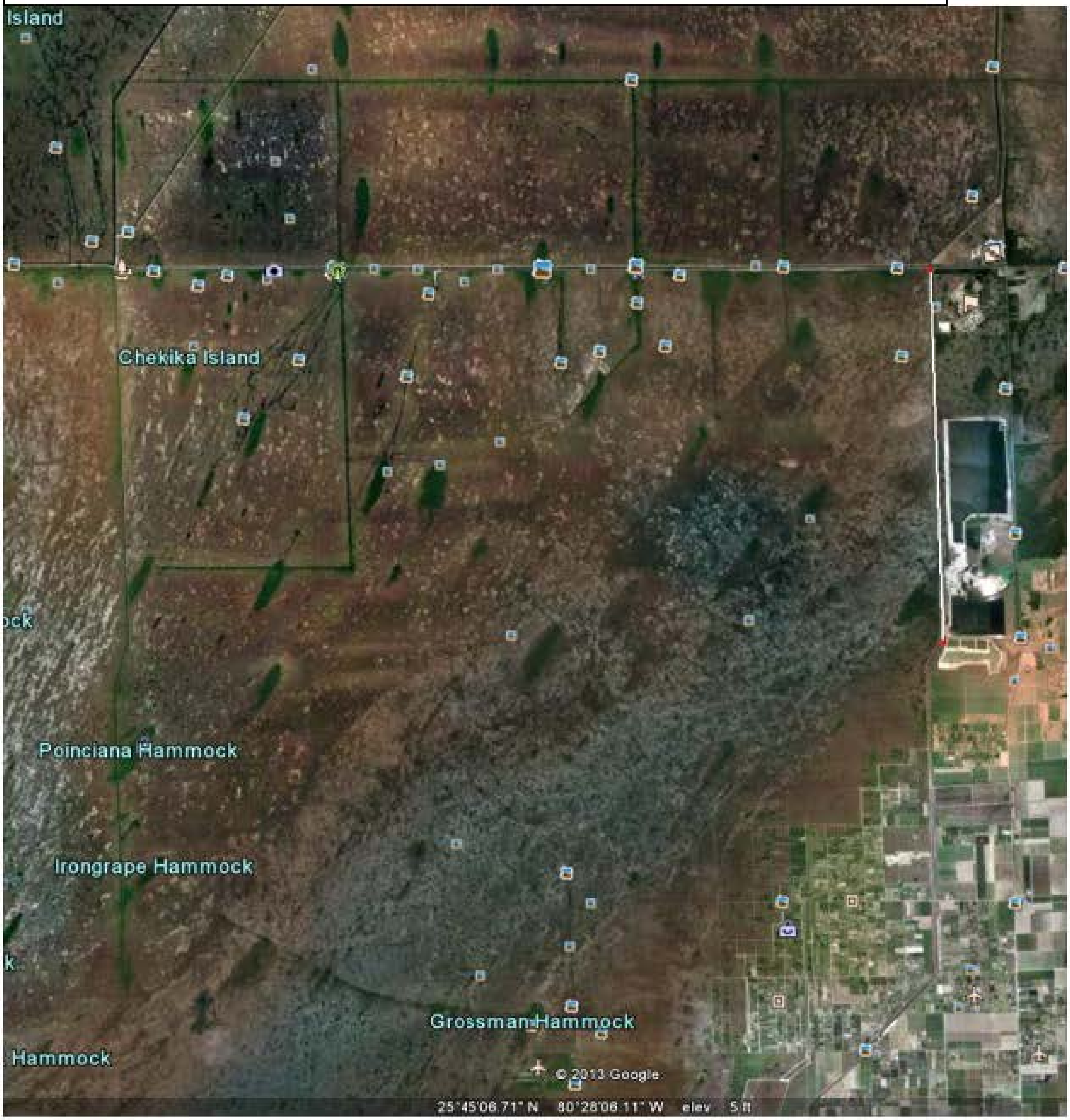
Given the potential cost savings and advancement of some project benefits that this option would produce, addressing the above issues appears to warrant consideration.

Preliminary disposition: *Address recommendation in current plan development, project design phase and in development of the Adaptive Management Plan.*

<u>Y-4 Phase implementation of seepage control features; use AM to determine path -</u> Adaptive management is a structured management approach to use when outcomes (positive and/or negative) from management actions are uncertain. Management actions are tested by linking science to performance questions and informing decision-makers and stakeholders on the best action to achieve objectives and avoid constraints. **Seepage management is both high risk to achieving both restoration goals and water supply constraints, and the need for high certainty (low uncertainty) is key to moving Everglades restoration goals forward.** Agencies are uncertain about the best design to control seepage, as well as amount of seepage management cutoff walls to implement and how to best operate the system to avoid water supply issues during the dry season. Using information gained from the L-31 pilot study, the rock miner's seepage management project, and regional simulation modeling, the seepage management project will be phased to implement a minimum level of construction to test seepage management performance as flows are increased into Water Conservation Area 3B and Northeast Shark River Slough, and monitor any potential reductions to water supply on the eastern side of the levee (see map below). Performance based monitoring of surface/groundwater stages and flows on either side of the seepage management feature will be used to reduce uncertainty about the level of seepage implementation, recommendations will be made for the next phase of seepage management construction or operations of the S-356 and South Dade detention areas. Same approach can be used during implementation of L-67 structures and Blue shanty levee with L-29 levee removal. Value is increased certainty about the right design and amount/approach for seepage management to meet multiple objectives and stakeholder interests with a potential for construction cost savings, if monitoring reveals less is needed to meet those goals.

Preliminary disposition: *Address recommendation in development of the Adaptive Management Plan*

Colored arrows represent different lengths of seepage management features being constructed, up to the TSP's 5 mile. Circle represents S-356 seepage return pump.



(RECOMMENDATION #54)Y-5 Change the location L31N Seepage Management Pilot Project (SMPP) to the location which was the original location contained in the authorized decision document; use CEPP to increase the 902 Limit for L31N SMPP and install the L31N SMPP to remove project uncertainties - L-31N Seepage Management – Pilot Project is an authorized component in the Central and Southern Florida Project, Comprehensive Review Study, Final Integrated Feasibility Report and Programmatic Environmental Impact Statement.

This recommendation proposes that:

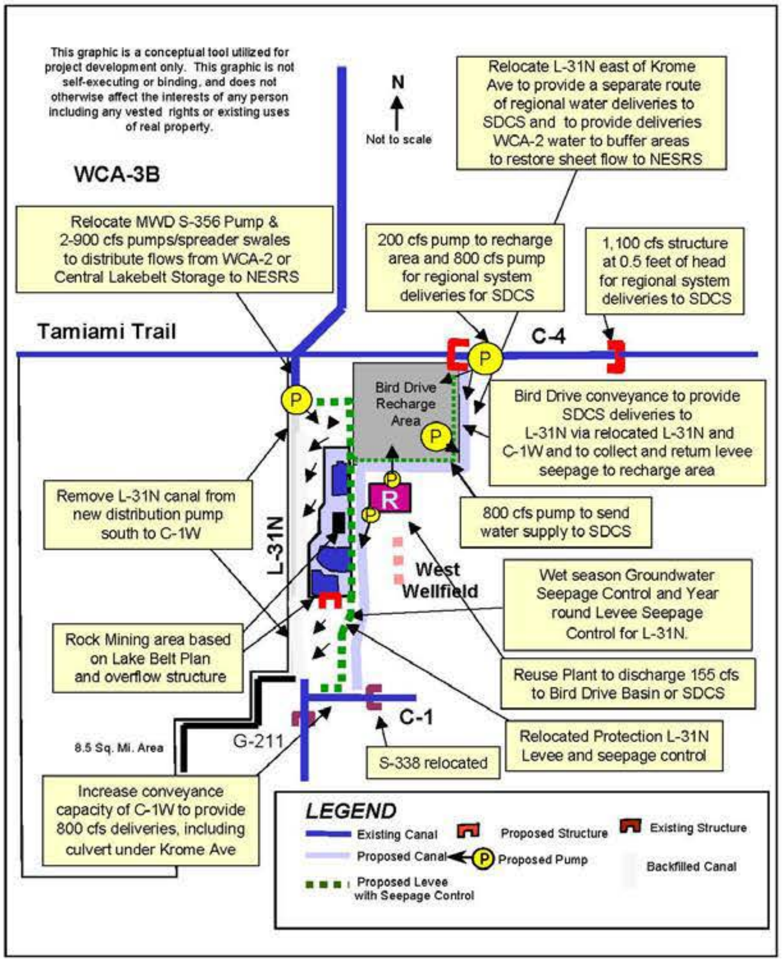
- The location of the pilot be returned to the original location as depicted on the below page excerpt from the study;

- CEPP be used to update the 902 limit for the pilot test and

- Implement the pilot test early in the project implementation phase to remove and define uncertainties.

As described in the restudy, the purpose of this feature is to reduce seepage flow across L-31N adjacent to Everglades National Park via a levee cutoff wall. Additionally, the feature was designed to reduce groundwater flows during the wet season by capturing groundwater flows with a series of groundwater wells adjacent to L-31N, then back-pumping those flows to Everglades National Park. The pilot project is necessary to determine the appropriate technology to control seepage from Everglades National Park. The pilot project will also provide necessary information to determine the appropriate amount of wet season groundwater flow to return that will minimize potential impacts to Miami-Dade County's West Wellfield and freshwater flows to Biscayne Bay.

Preliminary disposition: *Address recommendation in current plan development.*



Alternative D13R
Bird Drive Basin and L-31N Seepage Management
Component Map 7

Y-6 Investigate alternative seepage barrier cutoff wall means (such as vinyl sheet pile) -
Completed work on L-31N (L30) Seepage Barrier Pilot Project should be evaluated for possible cost-effective alternatives to the currently planned seepage cut-off wall in this reach.

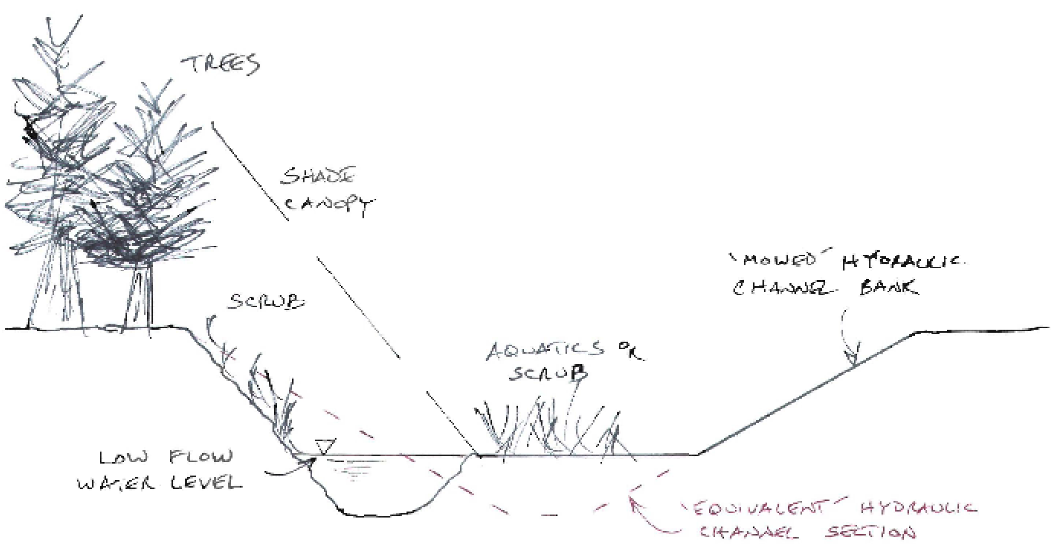
Preliminary disposition: *Address recommendation in project design phase.*

GENERAL CONSIDERATIONS

GC-1 Create 'environmental friendly' conveyance channels where opportunity exits –

Current plan alternative strategies identify trapezoidal channels for proposed conveyance modifications. It is suggested that where opportunity presents itself channels be designed and constructed in an 'environmentally friendly' manner as illustrated below. In such a design, the channel is oversized relative to a hydraulically equivalent mowed/maintained trapezoidal channel and is 'rough-cut' and allowed to vegetate. It may be practical for access and to ensure some form of snag removal maintenance, to mow only one side of the channel. As seen below, the 'sun bank' (summer sun – generally west or northwest side) is forested (planted if need be) to shade the permanent water bottom. This will lower summertime water temperature and improve oxygen content. The low flow immediate banks are allowed to overgrow with vegetation to create a complete stream habitat.

Preliminary disposition: *Address recommendation in both current plan development and project design phase.*

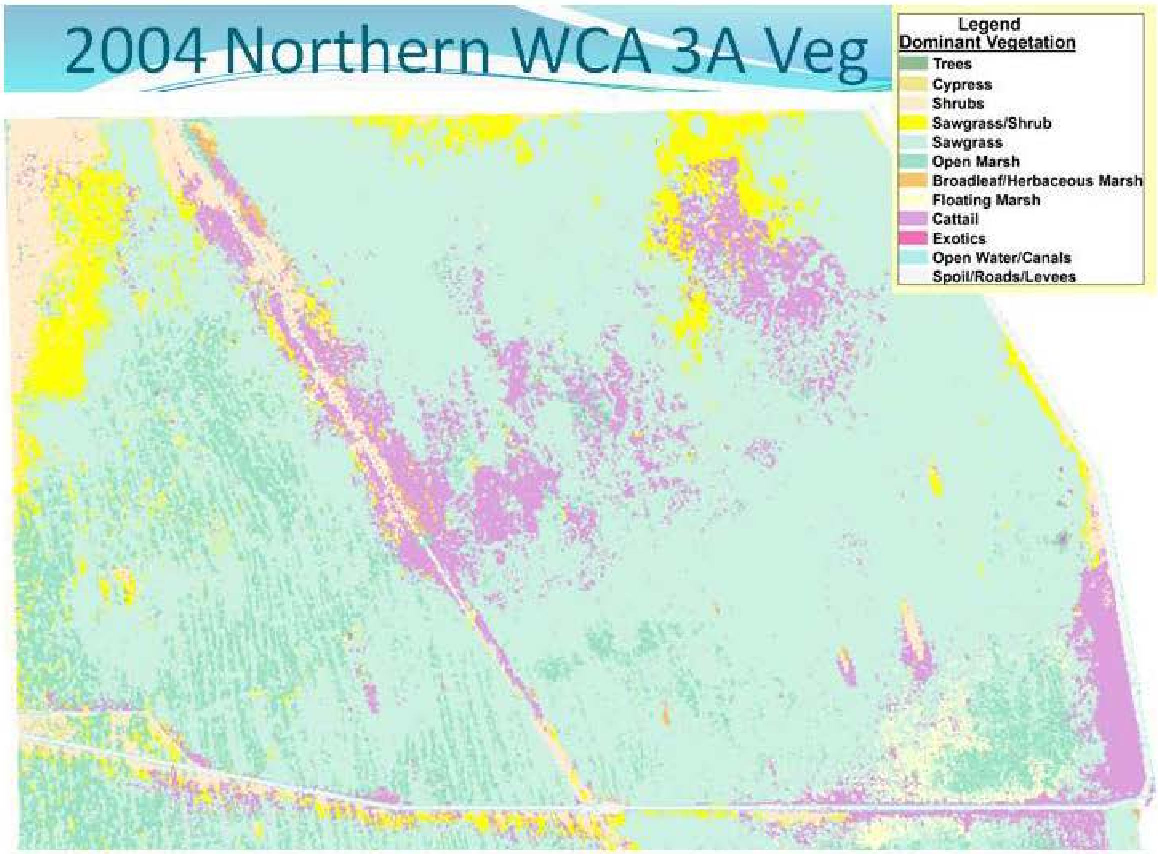


PROPOSED 'ENVIROMENTAL FRIENDLY' FLOW CONVEYANCE CHANNEL
TYPICAL SECTION – NO SCALE

GC-2 Coordinate vegetation management to achieve multiple objectives - Much of the vegetation south of L-4 levee are upland species due to the drying out of Northern Water Conservation Area 3A (WCA 3A). These woody species are likely to persist and may require specific vegetation management activities to facilitate transition of the landscape to more wetland type vegetation (e.g., sawgrass). Cattail and Willow expansion may be an issue and needs to be properly managed to avoided further degradation and complication in achieving a ridge and slough landscape south of the L4 spreader canal, as well as getting water out of the canal for flood control needs due to flow resistant vegetation. In addition, vegetation management will likely be needed during construction of the L4 spreader canal to remove nuisance and exotic species, as well as potentially create vegetation pockets to help facilitate flow of water to aid recreation of sloughs upon entry into marsh. There are likely opportunities to strategically coordinate multiple vegetation management objectives (e.g., construction, nuisance, and restoration enhancement) to most cost effectively implement vegetation management activities.

Timing and nature of each vegetation management activity would need to be discussed and coordinated amongst engineering design, construction, exotics removal, and ecological/adaptive management subteam to determine what vegetation management efforts are needed when and how they can be best be implemented.   The Invasive and Native Nuisance Species Management Plan (INNSMP) would address responsibilities and timing. The INNSMP is a living document. It would be updated/revised as surveys are done and treatment/removals conducted, and include proposed schedules of surveys. During O&M, the structures would be monitored by the responsible operations entity. Areas of claimed benefits outside of the structures would be monitored by the project (PLMP, RECOVER, or other). Close coordination among agencies would be required for such a program to succeed. Areas needed to be treated most times can be covered by existing services contracts that the USACE/SFWMD already has in place.

Preliminary disposition: *Address recommendation in development of Adaptive Management Plan.*


2004 Northern WCA 3A Veg
Legend
Dominant Vegetation
Trees
Cypress
Shrubs
Sawgrass/Shrub
Sawgrass
Open Marsh
Broadleaf/Herbaceous Marsh
Floating Marsh
Cattail
Exotics
Open Water/Canals
Spoil/Roads/Levees

GC-3 Optimize pump station design – A number of new pump stations are proposed for this project. Design precedent has been to adhere to SFWMD standards. The performance history of this type of pump station has been excellent but high construction cost is a project concern.

'Lessons learned' from among recent other Corps district projects could offer possibilities to improve current design cost-effectiveness.

Features that directly or indirectly affect pump station performance and cost include, but are not limited to the following:

- Mechanical unit redundancy
- Screen cleaning systems
- Discharge configuration (siphons or free discharge)
- Power supply
- Service crane(s) and structure size and configuration

Previous VE reviews of CERP/SFWMD pump stations have validated excellent design performance and cost-effectiveness of these items with primary change recommendations regarding the last item. The below discussion of possible design changes for the service crane and structure size and configurations should be considered.

For most large pump stations, common practice is to include a lifting crane of capacity and geometry to remove the largest piece of equipment from the station. The crane is usually housed in the pump station structure and usually results in significant station height and associated structural cost. It is arguable as to whether or not such a crane is required on-site as it is always a relatively rare and major scheduled event to pull a large unit. If a large crane can be transported to the site, then one could argue that an on-site crane of that large capacity is not needed (note that smaller units are still needed for routine maintenance).

If a large crane cannot be practically transported to the pump station for a major maintenance event and an on-site unit is necessary it does not have to be housed within the pump station building. A rail/gantry system can be used and pump housing roof and/or cover pod can be removed for access. Protection and/or aesthetics of the crane may warrant cover housing in the non-used position. This housing does not have to support the lifting load of the crane, however. The East Ascension Parish, Louisiana Pump Station (5 by 1,000 cfs units) station does not have an on-site large crane (see photo below). It has steel cover pods over each pump/engine unit and a weather protection roof across the station (roof added later and not included in photo). Roof panels and pods can be lifted by a portable crane when necessary. This design saved significant cost and has performed well since its 1993 installation. Aesthetics of roof and pod covers can be improved if required.
Building plan area appears to be excessive in these stations. Overall centerline width between pump unit bays is far more than necessary. Validation to reduce this dimension is based on the following rationale. First, it appears that both a maintenance lay-out space is provided as an

extra end-bay service area in the station as well as alongside each pump/engine unit. Normal practice of others is for the end-bay area only. As second factor is the slanting of engines at 45 degrees to reportedly allow visual inspection of the flanks of the engines from the central control room. Also not a common practice and this function could be accomplished via camera system.

While industrial building square footage is normally not excessively expensive, this is ***not*** the case for a pump station structure. ***Increased pump bay width is translated all the way down to the base of the station to the roof. In combination with the extra height of the internal crane this can easily be over 50-feet of multi-level structure elevation.***

Preliminary disposition: *Address recommendation in project design phase.*

1,000 CFS PUMP UNITS – EAST ACENSION PARISH, LOUISIANA

APPENDIX A: VALUE ENGINEERING JOB PLAN AND WORKSHOP AGENDA

This workshop included the six-phase Value Engineering Job Plan as sanctioned by USACE and SAVE International. This process, as listed below, was executed as part of daily activities as described in the following Workshop Agenda:

USACE VALUE ENGINEERING JOB PLAN

Information Phase. At the beginning of the study, the project team presents current planning and design status of the project. This includes a general overview and various project requirements. Project details are presented as appropriate. Discussion with the VE Team enhances the Team's knowledge and understanding of the project. A field trip to the project site may also be included as part of information gathering.

Function Analysis Phase. Key to the VE process is the Function Analysis Process. Analyzing the functional requirements of a project is essential to assuring an owner that the project has been designed to meet the stated criteria and its need and purpose. The analysis of these functions is a primary element in a value study, and is used to develop alternatives. This procedure is beneficial to the team, as it forces the participants to think in terms of functions and their relative value in meeting the project's need and purpose. This facilitates a deeper understanding of the project.

Creativity Phase. The Creativity Phase involves identifying and listing creative ideas. During this phase, the team participates in a brainstorming session to identify as many means as possible to provide the necessary project functions. Judgment of the ideas is not permitted in order to generate a broad range of ideas.

Evaluation Phase. The purpose of the Evaluation Phase was to systematically assess the potential impacts of ideas generated during the Creativity Phase relative to their potential for value improvement. Each idea is evaluated in terms of its potential impact to cost and overall project performance. Once each idea is fully evaluated, it is given a rating to identify whether it would be carried forward and developed as an alternative, presented as a design suggestion, dismissed from further consideration or is already being done.

Development Phase. During the Development Phase, ideas passing evaluation are expanded and developed into value alternatives. The development process considers such things as the impact to performance, cost, constructability, and schedule of the alternative concepts relative to the baseline concept. This analysis is prepared as appropriate for each alternative, and the information may include an initial cost and life-cycle cost comparisons. Each alternative describes the baseline concept and proposed changes and includes a technical discussion. Sketches and calculations may also included for each alternative as appropriate.

Presentation Phase. The VE Workshop concludes with a preliminary presentation of the value team's assessment of the project and value alternatives. The presentation provides an opportunity for the owner, project team, and stakeholders to preview the alternatives and develop an understanding of the rationale behind them.

Central Everglades Planning Project
Cost Schedule Risk Analysis/
Value Engineering Workshop
Agenda

Monday February 4, 2013 — 9:30 AM – 4:30 PM

Meeting Location:
SAJ Participants will meet in VTC Conference Room 4108, 4E

Call-in number:
USA Toll-Free: (888)273-3658
Access Code: 2717496
Security Code: 4321

Web Meeting Address:
https://www.webmeeting.att.com
Meeting Number: 8882733658
Access Code: 2717496

* The first time you use the Web Meeting Service, you will need to download the client software. Web Meeting HELP & Software Downloads can be found at: https://www.webmeeting.att.com*

09:30 – 09:40 am	**Introductions and Opening Remarks**	Kim Vitek, USACE
09:40 – 11:00 am	**Overview**	USACE
	• Value Engineering	Jimmy Matthews, USACE
	• Cost Schedule Risk Analysis	Amro Habib, USACE
	• CEPP Tentatively Selected Plan	Murika Davis, USACE
	• Expectations of Workshop	Kim Vitek, USACE
11:00 – 11:10 am	*Break*	
11:10 – 12:30 pm	**North of the Redline - *Storage and Treatment***	
	• Policy Issues	
	• Cost Risk & Other considerations	
	• Evaluate/Identify Value Engineering Ideas	
	• Construction Sequencing/Implementation	
12:30 – 01:30 pm	*Lunch*	
01:30 – 02:45 pm	**North of the Redline Cont'd**	
02:30 – 02:45 pm	*Break*	
02:45 – 04:25 pm	**South of the Redline – *Distribution/Conveyance* (*L-6 Diversions, L-5 Improvements and Spreader Canal*)**	
	• Policy Issues	
	• Cost Risk & Other considerations	
	• Evaluate/Identify Value Engineering Ideas	
	• Construction Sequencing/Implementation	
04:25 – 04:30 pm	**Next Steps - Closing Comments and Recap Assignments**	

Central Everglades Planning Project
Cost Schedule Risk Analysis/
Value Engineering Workshop
Day 2 Agenda

Tuesday February 5, 2013 — 9:00 AM – 4:30 PM

09:00 – 09:05 am	**Opening Remarks**	Kim Vitek, USACE
09:05 – 10:00 am	**South of the Redline Cont'd – *Distribution/Conveyance*** **(*Miami Canal Backfilling and L-28*)** • Policy Issues • Cost Risk & Other considerations • Evaluate/Identify Value Engineering Ideas • Construction Sequencing/Implementation	
10:00 – 10:15 am	*Break*	
10:15 – 12:00 pm	**Greenline – *Distribution/Conveyance*** **(*Structures in L-67A, Gaps in L-67C, S-333 increase*)** • Policy Issues • Cost Risk & Other considerations • Evaluate/Identify Value Engineering Ideas • Construction Sequencing/Implementation	
12:00 – 01:00 pm	*Lunch*	
01:00 – 03:00 pm	**Greenline Cont'd**	
03:00 – 03:15 pm	*Break*	
03:15 – 04:25 pm	**Blueline – *Distribution/Conveyance*** **(*Structures in L-29 levee, Degrade of L-67C ext, Improvements in 3B*)** • Policy Issues • Cost Risk & Other considerations • Evaluate/Identify Value Engineering Ideas	
04:25 – 04:30 pm	**Next Steps** **Closing Comments and Recap Assignments**	

Central Everglades Planning Project
Cost Schedule Risk Analysis/
Value Engineering Workshop
Day 3 Agenda

Wednesday February 6, 2013 9:00 AM – 4:30 PM

09:00 – 09:05 am	**Opening Remarks**	Kim Vitek, USACE
09:05 – 10:00 am	**Blueline Cont'd – *Distribution/Conveyance*** • Policy Issues • Cost Risk & Other considerations • Evaluate/Identify Value Engineering Ideas • Construction Sequencing/Implementation	
10:00 – 10:15 am	*Break*	
10:15 – 12:00 pm	**Yellow line – *Seepage Management*** **(*S-356 increase, partial depth seepage barrier, G-211 mods)*** • Policy Issues • Cost Risk & Other considerations • Evaluate/Identify Value Engineering Ideas • Construction Sequencing/Implementation	
12:00 – 01:00 pm	*Lunch*	
01:00 – 03:00 pm	**Yellowline Cont'd**	
03:00 – 03:15 pm	*Break*	
03:15 – 04:25 pm	**Value Engineering/Cost Assignments**	
04:25 – 04:30 pm	**Next Steps** **Closing Comments and Recap Assignments**	

Central Everglades Planning Project
Cost Schedule Risk Analysis/
Value Engineering Workshop
Day 4 Agenda

Thursday February 7, 2013 9:00 AM – 4:30 PM

09:00 – 09:05 am	**Opening Remarks**	Kim Vitek, USACE
09:05 – 10:30 pm	**System Wide Implementation** • CERP Overview • CEPP Schedule	 Kim Vitek, Matt Morrison
10:30 – 10:40 pm	*Break*	
10:40 – 11:55 pm	**Cont'd** • Implementation, Sequencing, Operations	
12:00 – 01:00 pm	*Lunch*	
01:00 – 03:00 pm	**Cont'd** • Cost Risks	
03:00 – 03:15 pm	*Break*	
03:15 – 04:25 pm	**Continued Discussions**	
04:25 – 04:30 pm	**Next Steps Closing Comments and Recap Assignments**	

Central Everglades Planning Project
Cost Schedule Risk Analysis/
Value Engineering Workshop
Day 5 Agenda

Friday February 8, 2013 — 9:00 AM – 12:00 PM

09:00 – 09:05 am	**Opening Remarks**	Kim Vitek, USACE
09:05 – 10:30 pm	**Review of Cost Risk Contingencies**	
10:30 – 10:40 pm	*Break*	
10:40 – 11:55 pm	**Review of Value Engineering Proposals**	
11:55 – 12:00 pm	**Next Steps and Closing Comments**	

APPENDIX B: WORKSHOP PARTICIPANT ROSTER

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Katrina Denson	USACE-CT
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Al Shirley (called in)	SFWMD
Paul Linton (called in)	SFWMD
Armando Ramerez	SFWMD

Matt Morrison		SFWMD
Agnes McClean	(called in)	ENP
Kevin Koton	(called in)	ENP
Bob Johnson	(called in)	ENP
Dennis Duke	(called in)	DOI
Inger Hansen	(called in)	FDEP
Miles Myers	(called in)	FWS
Liberta Scotto	(called in)	FWS
Lori Miller		FWS
Bob Rolgalsci		FWS

APPENDIX C: COST AND SCHEDULE RISK ANALYSIS MODERATE AND HIGH RISK ITEMS

NORTH OF REDLINE - COST AND SCHEDULE MODERATE AND HIGH RISK ITEMS			
	PROJECT & PROGRAM MGMT		
PPM-1	New Planning Process	Schedule risk project reaches mile stones and HQ revises or asks for changes to the process.	The conern is during the 3x3x3 planning phase HQ revises the anticipated out come of the planning study and delays in the schedule will be encounterd. This assumpition is due in part to the fact that this is a piolt study.
PPM-2	Cordination with DEP/Water Management	It is assumed that A1 will be completed prio to construction of A2.	The concern is that during construction there will be a need for on going comunication of the work and how it may affect the operation of existing structures.
	TECHNICAL RISKS		
TL-1	Maintain Flood Control	There is a pump station DS of the proposed location of the new spillway that can move 3700 CFS and the design of the new project feature is for 1500 CFS.	The spillway will need to match the size of the pump stattion and ensure that the flood control will still be maintained.
TL-2	Internal Water Convayance of the FEB	Existing ag canals in the proposed location of the FEB there are roads bordering each side of the canal	There is the posibility of piping through the proposed location of the premimiter levee. there is also the concern for not allowing sheet flow across the FEB with out Backfilling the AG canals.
TL-3	Spreader Canal	Assumed that the spreader canal is only on the norther end of the FEB.	There is conern that the canal my need to extend along the entire northern end to hydrate the east end of the FEB. this will in effect lengthen the canal
TL-4	Porisity of Lime Rock	Thre is the concert that the Lime rock is not capable of containing the Water	It is unknown what the geotechnical data is. There is concern that there could be a need to a liner or some way to ensure that there is minimial to no seepage. A1 will be constructed prior to A2 Management will need to watch this item.

SOUTH OF REDLINE - COST AND SCHEDULE MODERATE AND HIGH RISK ITEMS			
	PROJECT & PROGRAM MGMT		
PPM-1	New Planning Process	As the project reaches mile stones and HQ revises or asks for changes to the process.	The concern is during the 3x3x3 planning phase HQ revises the anticipated out come of the planning study and delays in the schedule will be encountered. This assumption is due in part to the fact that this is a pilot study.
	TECHNICAL RISKS		
TL-1	Maintain S-8 Flood Control	S-8 needs to provide flood control the entire time until downstream work is complete.	The work that effects the operation of S-8 must be complete prior to any modifications are completed at S-8. This could require material to be stock piled and additional cost for multiple handling of the material. There might also be a need for a temp canal to convey the water during construction.
TL-2	S-8 New Pump Station	The current plan is for a new pump station at the location of S-8.	There is a possibility of an opportunity that there could be an upgrade of the existing structure to achieve the same conveyance as a new pump station. The new pump station appears to be 1000 CFS short costs should be checked.
	CONSTRUCTION RISKS		
CON-2	L-28 Material	Concern of usage of material	There is a concern that the Tribes feel that the material is their property. There is a risk that new fill may be needed in the backfill of the canal in those locations and stock piling of the levee may be needed.
CON-3	Backfill of Miami Canal	There is concern for sequence of construction when backfilling the Miami Canal.	The concern is that the project will extend over multiple years and there will be a need for culverts, plugs, extra work that is not currently in the estimate. This will need to be looked at and studied further.
	ESTIMATE AND SCHEDULE RISKS		
EST-1	200 CFS Structure	New 200 CFS Structure located at the Intersection of the L-28, L-3, L-4 intersection.	The cost for the new structure is needed to ensure that the cost is not missed. Impact will be changed after the cost for the new structure has been added.
	PROGRAMATIC RISKS		
PR-1	Funding Restraints	There is concern that the project will be limited at $50 M per year for construction.	The concern is that funding will be lacking and multiple contracts will adversely affect the goal of the project. There is concern that the project will not meet the desired goals in the time frame anticipated.

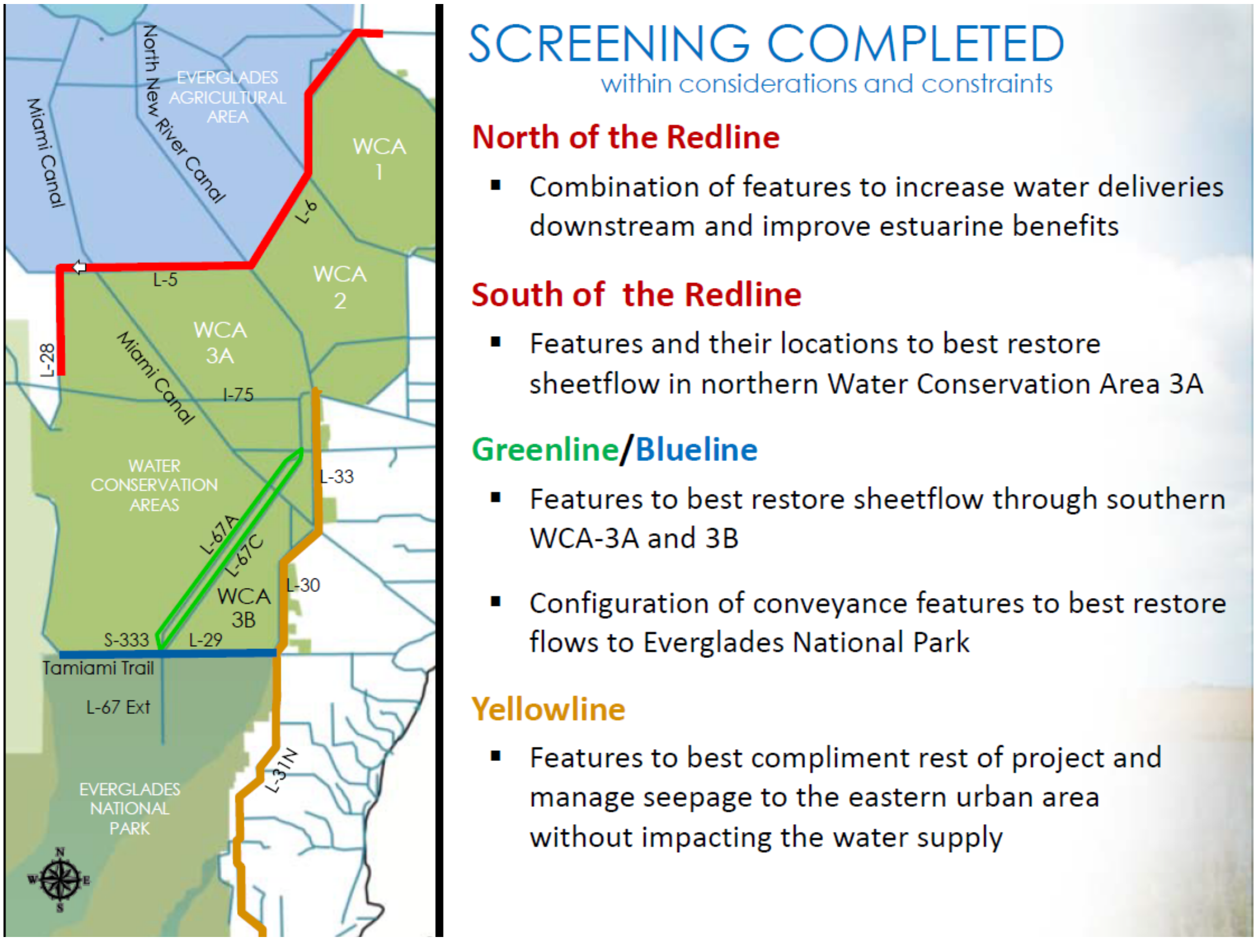
GREENLINE AND BLUELINE - COST AND SCHEDULE MODERATE AND HIGH RISK ITEMS

	PROJECT & PROGRAM MGMT		
PPM-1	New Planning Process	As the project reaches mile stones and HQ revises or asks for changes to the process.	The concern is during the 3x3x3 planning phase HQ revises the anticipated out come of the planning study and delays in the schedule will be encountered. This assumption is due in part to the fact that this is a pilot study.
	TECHNICAL RISKS		
TL-2	Tamiami Trail Bridges	This work needs to be completed prior to CEPP acting as designed.	There is always a risk that all work will not be complete and this could add addational cost to the estimate and impacts to the structure.
TL-3	Browerd County Water Preserve Area	This is work that will improve the water quality of the water provided to the Everglades National Park	This will need to be adressed in design and no effect cultural resources should be allowed.
TL-4	Old Tamiami Trail Removal	The old Trail is eligible or potentially eligible for national registry as a historical site.	The entire area is considered as eligible for the national historic registry any changes will need to be documented prior to construction. This will likely need to happen.
	LANDS AND DAMAGES RISKS		
LD-2	Policy Issues	If the current projoct is unable to obtain land to the 9.7 ft elevation it will need to be aquired under this project	Currently other prjoects have aquired land to the 8.5 elevation and it if they are not aquired to the 9.7 ft elevation. This is mainly at the location of fish camps and Airboat trails along the Tamiami Trail.
	REGULATORY AND ENVIRONMENTAL RISKS		
RE-1	Enviromental Impact	NEPA Impacats of changing the affected area unsure if the areas and volumes will ensure a net postive effect.	Foot print of impact and what is removed from the system will be equal. That initally inculded removing the L67C and backfilling the canal. It is unclear if the material will be available to be used in construction of the new blue shanty levee.
	CONSTRUCTION RISKS		
CON-1	Sequencing of Construction	On site material may not be available to construct new levee	With out understanding the sequancing of the construction there may not be access to all on site materal and new fill may be needed. the concern is also increased with the new design standards of levees.
	ESTIMATE AND SCHEDULE RISKS		
EST-1	Old Tamiami Trail	There is no cost in the estimate for removal of the old tamiami trail	This will need to be added to the estimate and schedule.
	PROGRAMATIC RISKS		
PR-1	Funding Restraints	There is concern that the project will be limited at $50 M per year for construction.	The concern is that funding will be lacking and multiple contracts will adversely affect the goal of the project. There is concern that the project will not meet the desired goals in the time frame anticipated.

YELLOWLINE - COST AND SCHEDULE MODERATE AND HIGH RISK ITEMS

	PROJECT & PROGRAM MGMT		
PPM-1	New Planning Process	As the project reaches mile stones and HQ revises or asks for changes to the process.	The concern is during the 3x3x3 planning phase HQ revises the anticipated out come of the planning study and delays in the schedule will be encountered. This assumption is due in part to the fact that this is a pilot study.
	TECHNICAL RISKS		
TL-2	Seepage Cutoff Walls Design and performance	There is limited to minimal long term data in the area that will show the success	There have been temp structures built but the long term performance is unknown at this time.
TL-3	Model Validation and Review- Accuracy and predictibility	There is always uncerntity of models at early stage designs	It is unknown if the depth of the seepage wall is the correct depth at 15 to 20% unsure of the accuracy of the depth.
TL-5	Design of Cutoff wall	Design thoght to be conservative overall however concequences are high if it does not work.	There is concern that there might be a need for windows in the cutoff wall along with injectionpumps and extensive monitoring.
	REGULATORY AND ENVIRONMENTAL RISKS		
RE-3	Water Quality	There is concern that there will be water quality issues that may need to be justified and validated to get necessary approval.	this concern is in part due to NEPA concerns about the quality of water that will be pumped out of the area. If the water quality is insufficent there could be major issues. Groundwater to Biscayne Bay may be an issue. Does water in canal equal water in goundwater table. Concerns with completion of other projects ensuring that system operates.
	ESTIMATE AND SCHEDULE RISKS		
EST-1	Unit Price of Cutoff Wall	The current assumption is assumed that the unit price includes all sepage monitoring	It is unknown at this time if the monitoring wells are correct.
EST-2	May Need Pilot Project Cutoff Wall	There is reason to belive that a piolt project needs to be installed	This price needs to be added to the estimate.
	PROGRAMMATIC RISKS		
PR-1	Funding Restraints	There is concern that the project will be limited at $50 M per year for construction.	The concern is that funding will be lacking and multiple contracts will adversely affect the goal of the project. There is concern that the project will not meet the desired goals in the time frame anticipated.
PR-2	Flooding of West Miami	There is uncerntity that if the seepage barrior is not installed there would be posibility of flooding miami	There is the belife that some operational configuaations can alaviate the seepage.
PR-3	Biscane Bay	Fresh water supplied from WCA3 to the Bay flowing through miami.	There is the risk that water may need to be supplied to the Bay this is in the dry season to supply water to the well fields and also the southern bays. There should be water suppled to the area during the dry season.

APPENDIX D: PROJECT FUNCTIONS BY AREA

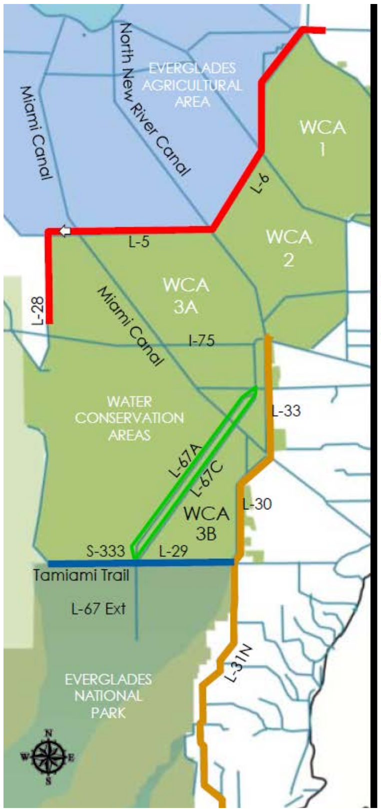


Define and Implement PED
Develop project life cycle costs and schedule
Develop project construction sequencing

Adaptively Manage Implementation Sequence

Good AM candidates are those features that can be adjusted (e.g., operations “adjust features”, sequentially implemented “construct features, contracts, and installation in sequence with goal of learning”, or easily modified “increase dimensions”) in order to address questions about improving project performance, schedule and/or minimizing total project costs.

Identify AM Candidates
Increment Features
Increment Dimensions
Increment Contracts
Incrementally Install
Monitor Features
Assess Features



INFRASTRUCTURE CONSIDERED

QUANTITY AND QUALITY
Storage/Treatment

- Stormwater Treatment Areas (STAs)
- Flowage Equalization Basins (FEB)
- Deep Storage (various depths)

CONVEYANCE AND DISTRIBUTION
Distribution, Directionality, Timing
Controlled versus not Controlled

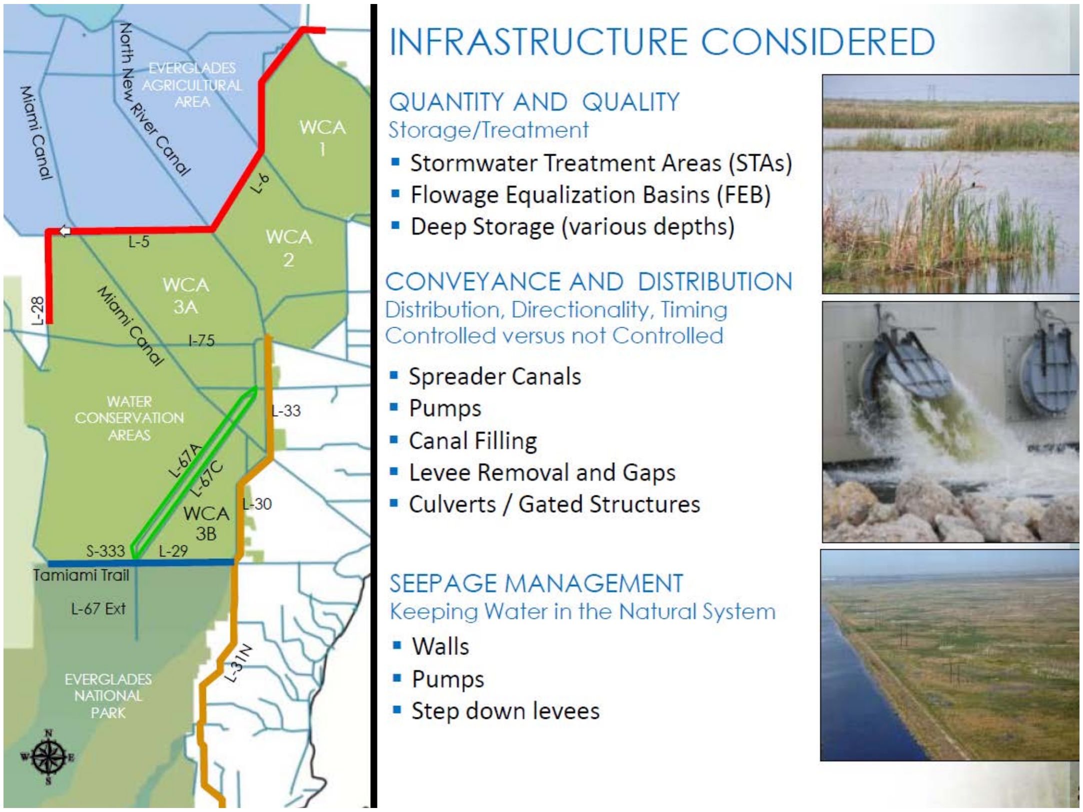
- Spreader Canals
- Pumps
- Canal Filling
- Levee Removal and Gaps
- Culverts / Gated Structures

SEEPAGE MANAGEMENT
Keeping Water in the Natural System

- Walls
- Pumps
- Step down levees

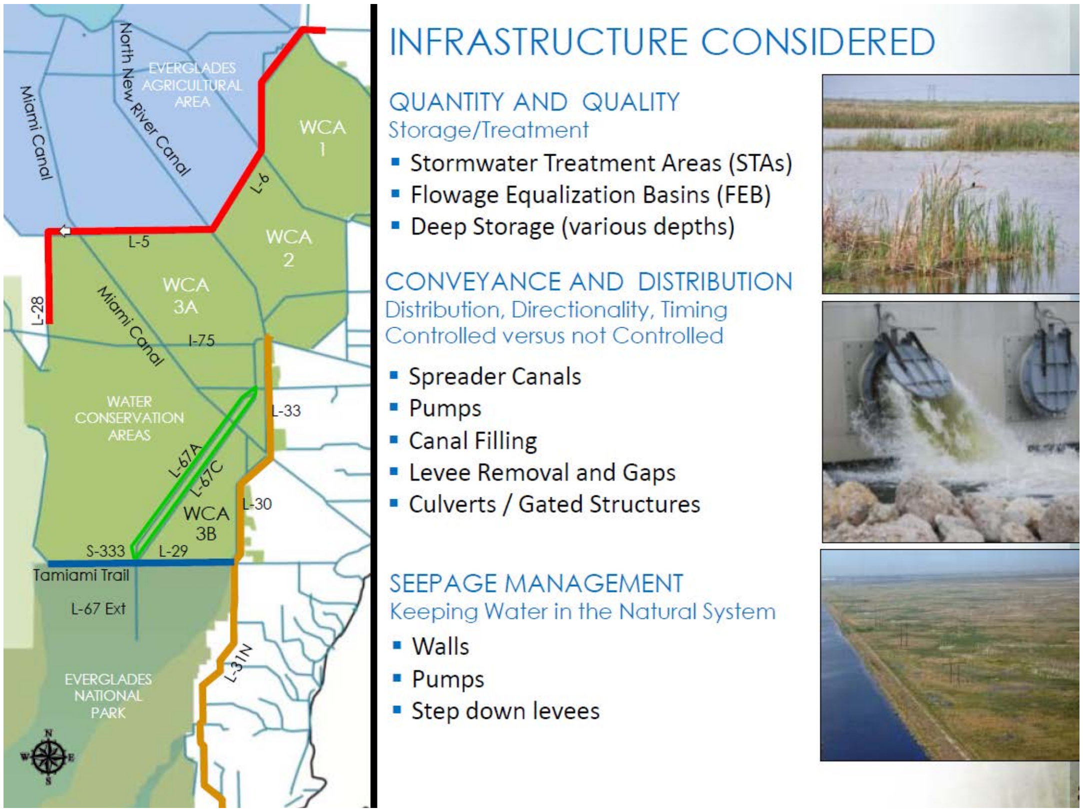
North of Redline
STORAGE AND TREATMENT

Store Water
Treat Water
Adjust Quantity
Correct Timing
Maintain Flood Protection
Control Cost Growth



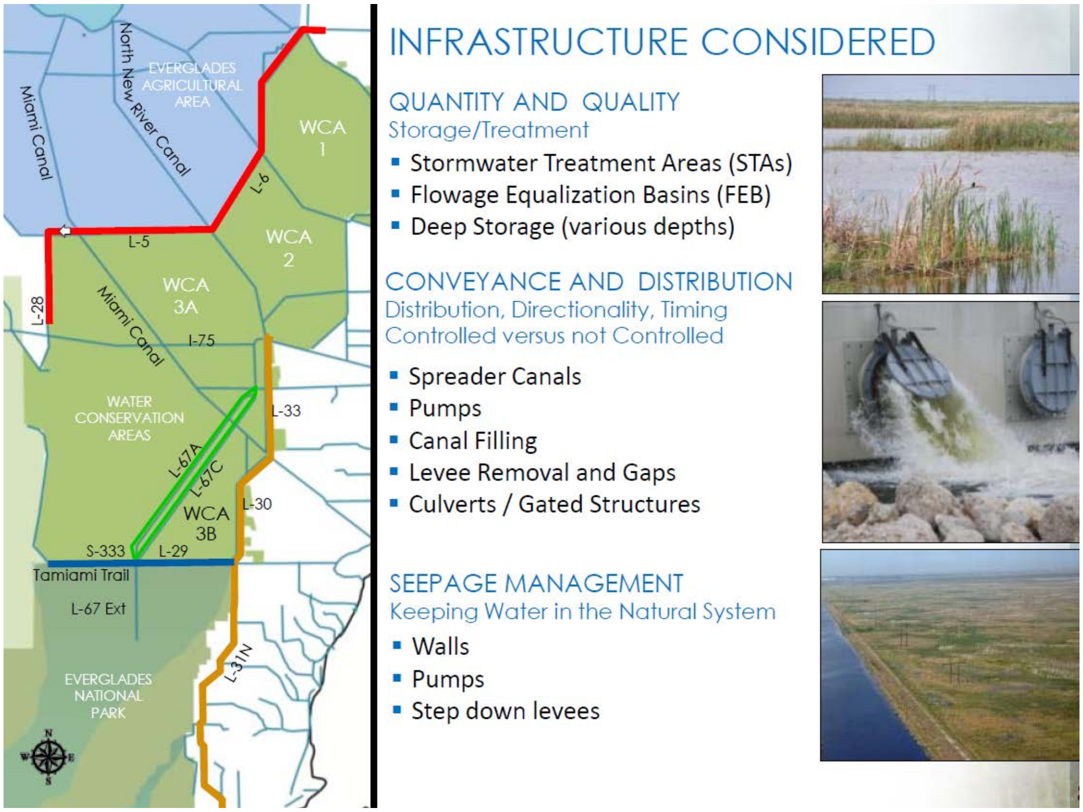
South of Redline

DISTRIBUTION/CONVEYANCE
Distribute Water
Convey Water
Adjust Quantity
Correct Timing
Improve Quality
Remove Flow Impediments
Restore Hydro pattern
Rehydrate Habitat
Reconnect/Connect Flow ways
Maintain Flood Protection



Green / Blueline
DISTRIBUTION/CONVEYANCE

Distribute Water
Convey Water
Adjust Quantity
Correct Timing
Improve Quality
Remove Flow Impediments
Restore Hydro pattern
Rehydrate Habitat
Reconnect/Connect Flow ways
Maintain Flood Protection



Yellowline

SEEPAGE MANAGEMENT
Manage Seepage
Maintain Flood Protection
Capture and/or Return Seepage
Block Seepage Pathways
Reduce or Eliminate Losses
Protect Water Supply

APPENDIX E: SPECULATION AND EVALUATION LISTS

Y/N	SPEC NO.	Recommendations
		Above RED LINE 1-20
y	1	2 cell FEB
y	w/1	Internal baffling, breaking fetch length
n	2	integrate A-1 west levee
y	4	overflow weir and DS-9, include in A-1 construction
n	5	cut off wall
n	6	import clay
n	7	hydrologic ridge with seepage return water
bd	8	redirect to one pump sta and return
n	9	install perimeter relief wells and back pump
n	10	ASRs with FEB to maintain head
n	11	deepen seepage canal
bd	12	move water out faster
bd	13	investigate A-1 & previous STA designs and use in project scoping
bd	14	Develop strategic installation plan
bd	15	use cast in place for box culverts
y	16	add gravity structure on SE side of A-2
y	17	increasing the gate structure to maintain flood protection
		Below RED LINE 21-29
y	21	Add HP and/or supplemental open structure pump @ S-8
y	22	Add new pump station
n	23	consider gravity diversion
y	24	power diversion or pressurized diversion
y	25	optimze new pump sta design
y	26	coordinate veg management to meet mulitple objectives
y	27	integrate and optimze s-8 and g-404 system
y	28	build eco friendly canals, benches, etc..
y	29	2a look at operation schedule, raise the operation schedule 0.5 feet at end of wet season, slow return in dry season
y	30 w/29	present USFWS/FWC operation schedule to pdt for inclusion into project
n	31	make s-8 a dam, gap l4 & l5 on s ends, push mounds into gaps and then plug at I-75
y	32	add AM strategy for G-336G (L6 Diversion)
		GREEN and BLUE LINE 30-50
n	31	for levees being used for recreation access use min levee crown of 16' w/ surface stone
bd	33	construction sequencing for AM
n	36	plug in L-67A to block water quality… partial or full plug…
n	37	L-67A environmentally friendly canals, re-design to improve marsh to canal connectivity,
Y	38	plug the Miami Canal S of C-11 extension, use C-11 spoil material for the plug
bd	39	consider shifting blue shanty levee to make shorter and min impacts while achieving proj object
n	40	not extend blue shanty n of l-67c into pocket
y	41	remove only 1.5 miles of L-67 extension & optionally leave old TT intact as well; apply A.M.; evaluate borrow needs
n	42	consider reducing levee cross section
y	43 w 41	remove most or all of L-67 extension and not fill canal, add to 41
y	44 w 41	use spoil material to build blue shanty levee, add to 43; consider material quantity and processing
bd	45	backfill the L-67C canal, within BS flow way
y	46	construct 0.4 mile collector canal expansion from 355B to the W
y	34	plugs/culverts revisit L-29 divide structure to determine functon and flow rate
y	47	construct spreader canals S of TT at culverts
y	35	modify the ag ditches in flow way… fill, plug, gap, etc…
bd	48	optimize location of S333 structure
n	49	consider relocating S355B eastward in line w/ 1 mile eastern bridge
n	50	increase most northern structure into WCA 3B from 500 to 750cfs
y	51	optimize operations at most northern structure into WCA 3B from 500
y	52	retrofit DPM structure; use DPM structure for interim period
n	53	add ~ 75 cfs pump sta to add water into the N of 3B
y	54	use veg management to reduce n values S of eastern flow way structure (S345D & G)

Y/N	SPEC NO.	Recommendations
		YELLOW LINE 51-70
y	51	Phasing implemention - Use AM to determine path
y	52	consider defer pump sta construction until after seepage wall placement and monitoring; utilitze existing pump sta S-356
y	53	investigate alternative cut off wall materials (vinyl sheet pile)
y	54	change location L31N SMPP to this location; use yellow book authority; use original yellow book location
n	55	use electric motors for pump sta w/ d backup
y	56	Determine pump station firm capacity based on functional risk (e.g., 1,000 to 750 cfs)
n	57	assess the backup power for pump sta based on risk
y	58w/54	compare technologies in phased approach to determine final wall section, combine w/54
y	59	use S-356 to reduce project water quality uncertainty & risk
y	60w/59	add to TSP for future purpose
n	61	increase depth of seepage wall and eliminate pump sta; address source change
bd	62w/67	use varible depths for cut off wall; consider in pilot testing
n	63	add STA to treat pump water out flow
y	64	use reclaimed water for project, reference yellow book
y	65 w/59	consider a two location pump sta scheme for S-356
bd	67	add additional seepage wall demonstration testing

y = accept
n = do not accept
bd = already being done

WRITE UP NO	Recommendations	OUT BRIEF DISPOSITION:
1	Use two or more basin cells and/or wave-break structures to reduce wind fetch length	D
2	Integrate A-1 west levee with A-2 east levee	R & P
3	Add overflow weir and DS-9, include in A-1 construction	D
4	Recommendation Deleted, bd	
5	Add gravity structure on SE side of A-2	R & P
7	In-Line Structure for North New River Canal	R & P
6	Increase the gate structure to maintain flood protection flow rate and water elevation	R & P
21	Add HP and/or supplemental open structure pump @ S-8	P
22	Add new pump station	P
23	power diversion or pressurized diversion	D
24	optimize new pump sta design	P
25	coordinate veg management to meet multiple objectives	AM
26	integrate and optimize s-8 and g-404 system	R & P
27	build eco friendly canals, benches, etc..	R & P
28	2a look at operation schedule, raise the operation schedule 0.5 feet at end of wet season, slow return in dry season	
29 w/28	present USFWS/FWC operation schedule to pdt for inclusion into project	
30	add AM strategy for G-336G (L6 Diversion)	R & AM
31	remove only 1.5 miles of L-67 extension & optionally leave old TT intact as well; apply A.M.; evaluate borrow needs	AM
32 w 31	remove most or all of L-67 extension and not fill canal, add to 41	
33 w 31	use spoil material to build blue shanty levee, add to 43; consider material quantity and processing	
34	construct 0.4 mile collector canal expansion from 355B to the W	R & AM
34A	plugs/culverts, revisit L-29 divide structure to determine function and flow rate (1,350 cfs)	R & AM
35	construct spreader canals S of TT at culverts	D
35A	modify the ag ditches in flow way… fill, plug, gap, etc…	R & AM
36	optimize operations at most northern structure into WCA 3B from 500 cfs	P & AM
37	retrofit DPM structure; use DPM structure for interim period	R & AM
38	use veg management to reduce n values S of eastern flow way structure (S345D & G)	AM
39	Recommendation deleted, bd	
51	Phasing implementation - Use AM to determine path	AM
52	consider defer pump sta construction until after seepage wall placement and monitoring; utilize existing pump sta S-356	R & P
53	investigate alternative cut off wall materials (vinyl sheet pile)	R & P

54	change location L31N SMPP to this location; use yellow book authority; use original yellow book location	
55	not used	
56	Determine pump station firm capacity based on functional risk (e.g., 1,000 to 750 cfs)	R & AM
57	not used	
58w/54	compare technologies in phased approach to determine final wall section, combine w/54	
59	use S-356 to reduce project water quality uncertainty & risk	
60w/59	add to TSP for future purpose	
61	not used	
62w/67	not used, bd	
63		
64	use reclaimed water for project, reference yellow book	D
65 w/59	consider a two location pump sta scheme for S-356	
67	not used, bd	

Table Key: R = Report
P = PED
AM = Adapt Mgt
D = Drop

APPENDIX F: TENTATIVELY SELECTED PLAN PROJECT FEATURES ON DATE OF WORKSHOP

North and South of Redline Features:

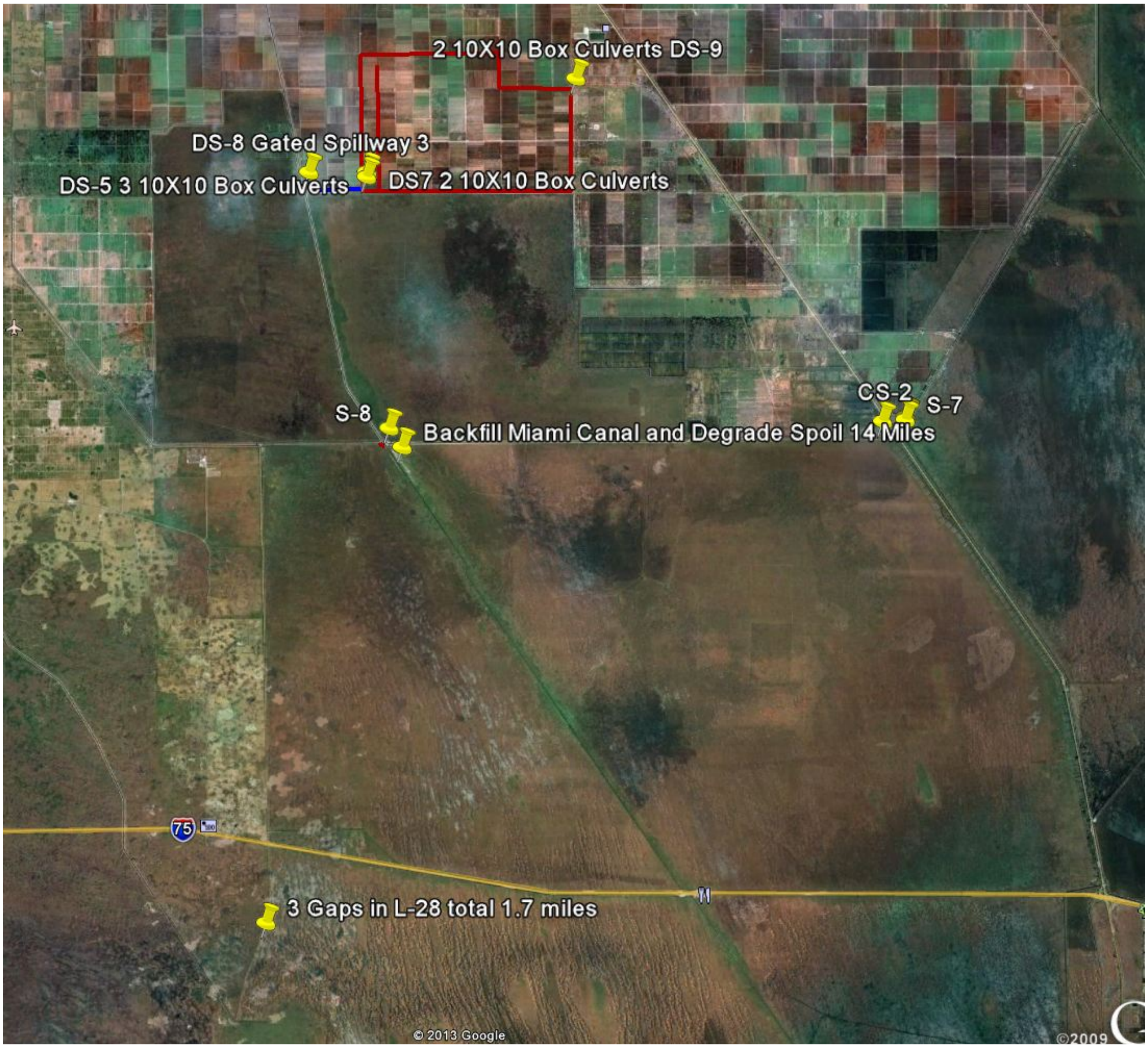


Figure 1 –Total Redline Work

Figure 2 –A-2

Flow Equalization Basin (FEB) A-2 consists of:

Perimeter levee 11 miles around 11.3 feet high, 14ft crest width with 3:1 side slopes
Inflow Canal & Internal levee 4 miles long, 10ft deep canal, 60 ft bottom width, 126ft top width, LSS 4:1, RSS 2:1 11 feet high with 3:1 side slopes
External outflow canal 1.5 miles long with a 50 foot bottom width 17.5 foot depth 2:1 side slopes (1,500 -2,000 cfs)
DS-5 3 Sag Culvert 10X10 culverts inflow (1,500 - 2,000 cfs)
DS-7 outflow 2 9x9 box culverts (2,000 cfs)
DS-8 gated spillway with 3 26X15 gates (1,550 cfs), DS-9 2 9x9 box culverts (930 cfs), Emergency overflow weir 1,500 feet long (3,000 cfs)
Recreational Features:

Figure 3 - L-6 Deliveries (near L-5/S-7) Features

L-6 Deliveries (near L-5/S-7) Features:
CS-1 500 cfs gated box culvert
CS-2 4200 cfs Spillway (STA ¾ discharges)
G-336G Improvements (changing open weir risers to gated culverts)? This may not be needed at all.

Figure 4 – L-5 Conveyance and Improvements

L-5 Conveyance & Improvements (east and west of plug) features: to accommodate full L-6 and STA 3/4 conveyances, 500 cfs and 2500 cfs (3000 cfs total)
L-5 500 cfs gravity structure (plug is removed) 9 9ftx11ft wide 100ft long concrete barrel culverts
West L-5 canal improvements - west portion required an expansion to a bottom width of 100 ft and a deepening to bottom elevation -5.6 ft NGVD (-7.0 ft NAVD).
East L-5 canal improvements - east portion of L-5 required an expansion to a bottom width of 50 ft and a deepening to bottom elevation of -5.1 ft NGVD (-6.5 ft NAVD) . Total excavation for both ~1.97 MCY.

Figure 5 – S-8 Improvements

S-8 Improvements

Construct a set of pipes to convey 3000 cfs into L-5 canal while maintaining 1000 cfs conveyance down Miami Canal.
Degrade 2.9 miles of L-4 interior levee starting 1 mile west of S-8.
200 cfs pump station at end of L-4/L-28 connection (this is still being discussed).

Figure 6 – L-28 Gaps

L-28 Gaps

Provide 3 gaps in the L-28 levee for a total of 1.7 miles.
Backfill canal.

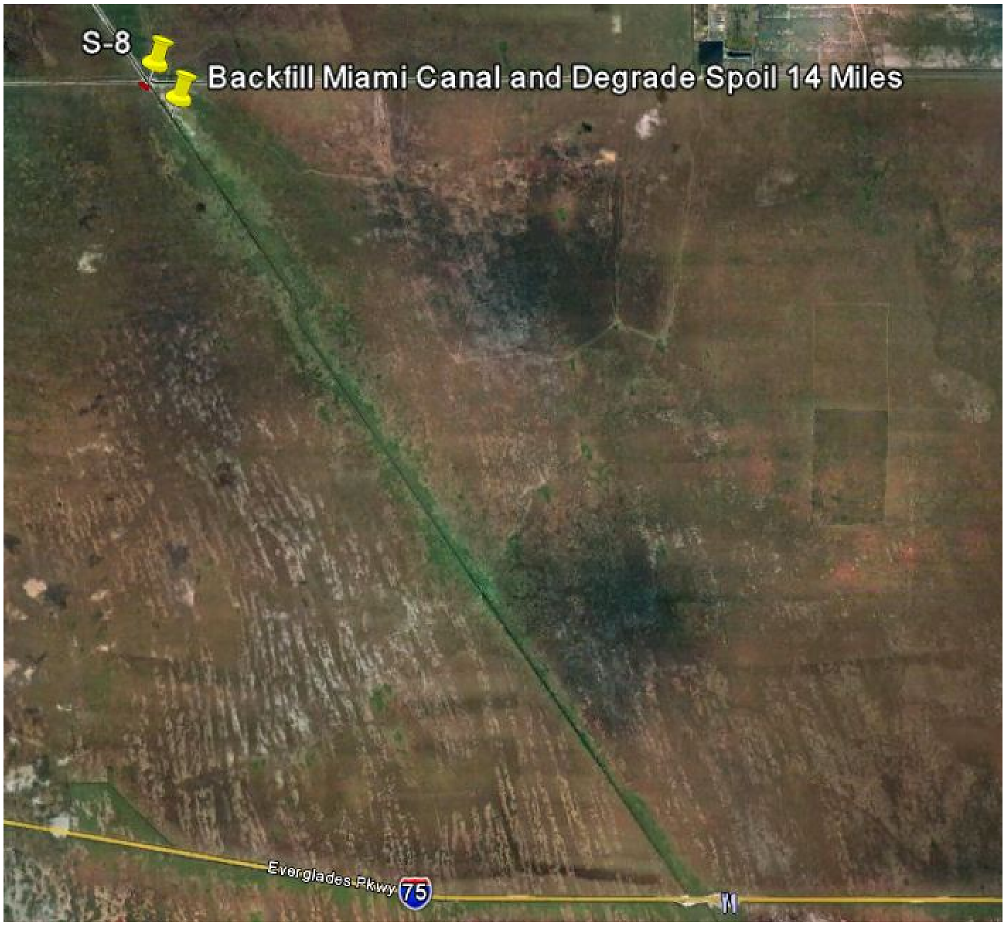


Figure 7 – Miami Canal Improvements

Miami Canal Improvements

Backfill approximately 14 miles of Miami Canal to a point south of S-8 that allows flows of 1000 cfs to I-75.
Degrade spoil mounds North of S-339 and hybrid (leaving some created mounds in place) approach South of S-339.
Create Tree Island Mounds every 1 mile north S-339 and hybrid configuration south of S-339.

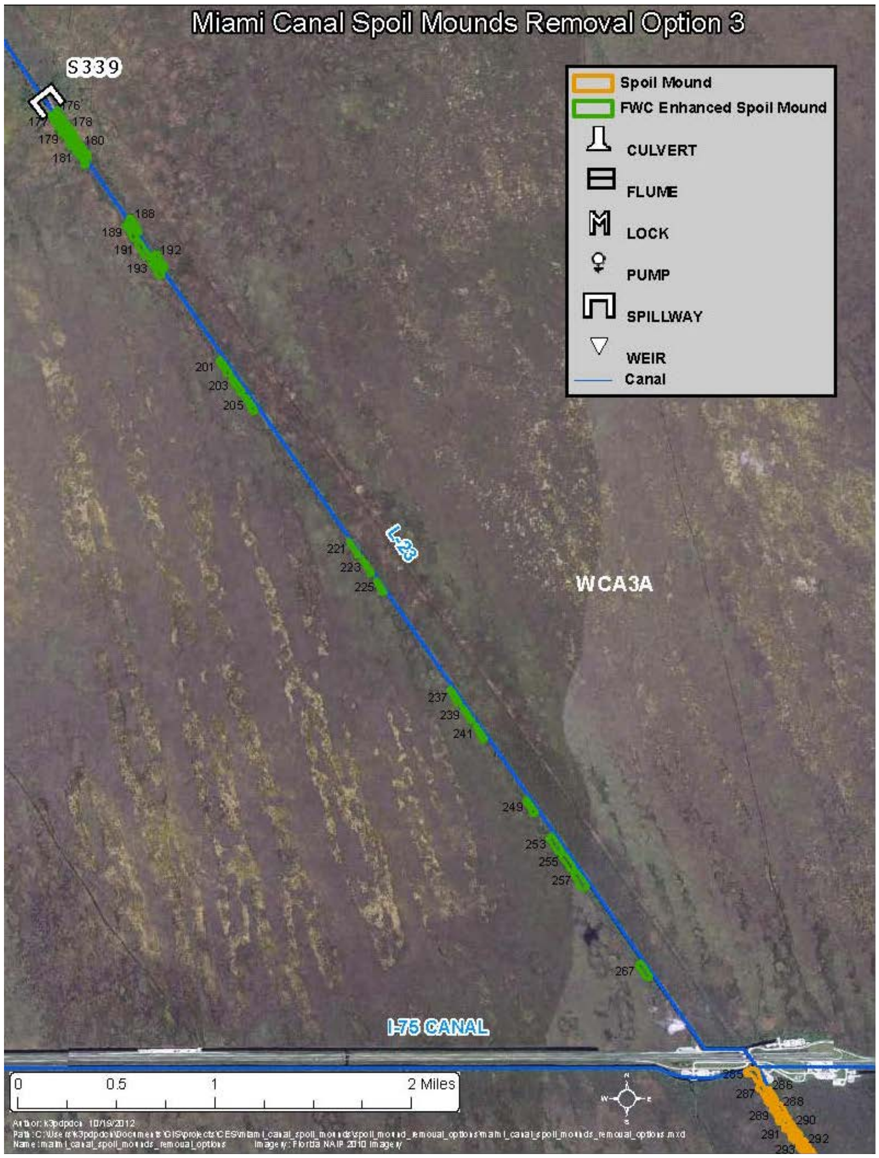


Figure 8 – Miami Canal Proposed Spoil Mounds

Greenline and Blueline Features:

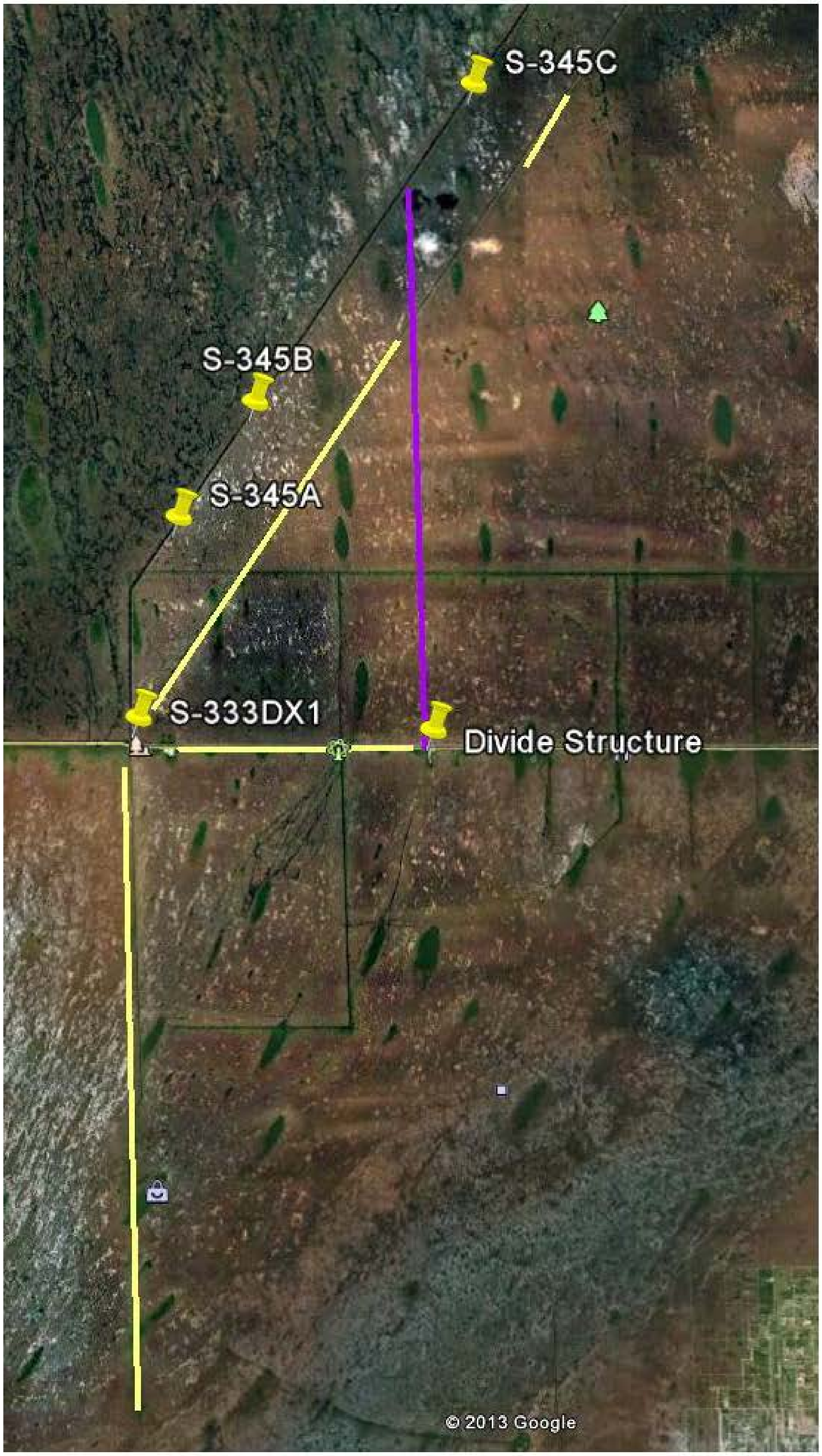


Figure 9 –Greenline and Blueline Features

Greenline and Blueline

Modify S-333 by adding additional structure (temporarily named S-333DX1) to the north with canal. The capacity of the structure is 2 bay 1350 cfs structure similar to S-65EX1. (New S-333 capacity ~2500 cfs).
Install 3 (500) cfs structures on L-67A. S-345 A, B south of new levee in WCA-3B and S-345 C north of new levee. These structures will be designed similar to S-152 (Decomp Physical Model) 10 HDPE pipes 60 inches in diameter with gated structures.
Gap 6000 feet of L-67C near S-345 C.
Degrade L-67C levee (8 miles) from south to the new levee.
Construct 8.5 mile New levee in WCA-3B 6 feet above grade 14’ top width with 1 on 3 from L-29 to L-67A.
Remove spoil mounds west of L-67A canal near S-345’s.
Divide Structure in L-29 Gated Stucture 1,300 cfs with bridge providing access back to Tamiami Trail
Degrade L-29 levee (4.3 miles) east of the monument to the New levee in WCA-3B
Degrade remaining 5.5 miles L-67 Extension and backfill L-67C canal.
Removal of Old Tamiami Trail west of L-67 ext, ~ 6 miles to Tram Rd.

Yellowline Features:

Figure 10 - Yellowline Features

Yellowline

Demolish S-356
Install new pump station north of the current S-334/S-356 location of 1000 cfs. The station shall have a redundant pump.
Install a seepage cut off wall south of Tamiami Trail down L-31N to connect to the existing wall for a length of 3 miles and 30 feet deep.

Structure/Feature Number	Structure/Feature Type	Design Capacity (cfs)	Location	Tech Specs & Notes
NORTH OF THE REDLINE – FLOW EQUALIZATION BASIN (FEB) – A 2				
S-623 (DS-8)	Gated Spillway	3700	In Miami Canal	Delivers water from Miami Canal to G-372
S-624 (DS-5)	Gated Sag Culvert FEB inflow structure	1550	On STA 3 / 4 Supply Canal	Receives water from G-372 via STA 3 / 4 Supply Canal and delivers to C-624 canal.
S-625 (DS-7)	Gated Culverts FEB discharge structure	1550	Discharge structure in FEB perimeter levee L-624	Delivers water to FEB outflow canal
S-626 (PS-1)	Seepage Pump Station	400	West side of seepage canal, C-626	Delivers seepage back into the canal/FEB
S-627 (CS-4)	Emergency Overflow weir	3000	Between A-2 and A-1 FEB, just north of S-627	
S-628 (DS-9)	Gated Culvert FEB intake/ discharge structure	930	Between A-2 and A-1 FEB	Delivers water between A-2 & A-1
L-624	Levee		FEB Perimeter Levee	~ 20 miles, el 20.3
L-625	Levee		FEB interior inflow canal levee	~ 4 miles,
C-624	Inflow Canal	1550	West side of FEB	~ 4 miles
C-624E	Spreader Canal		Northern boundary of FEB	~ 4+ miles
C-625E	Collection Canal	400	FEB interior collection canal; southern perimeter	Only provides conveyance when no sustained pool depth (i.e., only sheet flow)
C-625W	Outflow Canal	1550	FEB exterior outflow; between S-625 and G-372 HW	FEB Outflow is the existing seepage canal for the STA 3 / 4 Supply Canal
C-626	Seepage Canal	400	West and Northern exterior perimeter of FEB	~ 4 miles
SOUTH OF THE REDLINE – DIVERSION & CONVEYANCE				
S-620 (CS-1)	Gated Culvert	500	In L-6 Canal	Delivers water from L-6 canal to L-5 canal
S-621 (CS-2)	Gated Spillway	2500	On STA 3 / 4 Outflow Canal	
S-622 (CS-3)	Gated Spillway	500	In L-5 Canal	Delivers water from west to east in L-5 canal
New (S-8A) PS	Gated Culverts w/canal	3080 & 1020	In Miami and L-4 Canal	Delivers water from L-5 west to L-4
S-630	Pump Station	200	In L-4 Canal	Delivers water from L-4 canal west
	Levee Removal		L-4 Interior Levee	Removal of ~2.9 miles

	Levee Removal Gapping		L-28 Levee	Removal of ~ 1.7 miles = 3 gaps w/canal backfill
	Canal Backfilling		Miami Canal	Remove ~ 13.5 miles
	Tree Islands Mounds		Miami Canal	Create habitat and promote sheetflow in WCA-3A
Structure/Feature Number	**Structure/Feature Type**	**Design Capacity (cfs)**	**Location**	**Tech Specs & Notes**
SOUTH OF THE REDLINE CONT'D – DIVERSION & CONVEYANCE				
	Canal	500	L-5 east	Enlarging canal
	Canal	3000	L-5 west	Enlarging canal
BLUE GREEN YELLOW LINE – DISTRIBUTION, CONVEYANCE & SEEPAGE MANAGEMENT				
S-333 (N)	Gated Spillway w/new canal	1150	Just north of existing S-333	Delivers water from L-67A to L-29 canal
New S-356	Pump Station	1000	In vicinity of existing S-356	
S-631	Gated Culvert	500	In L-67A levee	Delivers water from WCA 3A to 3B
S-632	Gated Culvert	500	In L-67A levee	Delivers water from WCA 3A to 3B
S-633	Gated Culvert	500	In L-67A levee	Delivers water from WCA 3A to 3B
	Levee Removal Gap		In L-67C levee	~ 6000 ft gap corresponding to S-631
L-67D	New Levee		In WCA 3B	~ 8.5 miles connects from L-67A to L-29 14 crest width, 3:1 side slopes, 6 ft high
	Levee Removal		L-67C levee	~ 8 miles removal from New 3B Levee south to intersection of L-67A
S-355W	Gated Spillway	1230	In L29, east of New 3B levee terminus and TT 2.6 miles bridge	Delivers water from L-29 to S-356 & provides access for Tigertail Camp to Tamiami Trail.
	Levee Removal		In L-29 levee	~ 4.3 miles removal east of Valuejet monument to L-67D start.
	Road Removal		Old Tamiami Trail (from L-67 Ext west to tram Rd)	~ 6 miles of Old roadway removal
	Levee Removal		In L-67 Ext levee	~ 5.5 miles of L-67 Ext removal
	Seepage Barrier Cutoff Wall		In L-31N levee just south of Tamiami Trail	~3.5 miles of 3ft wide, 35 ft deep, Soil Cement Bentonite (SCB) Wall
	cfs = cubic feet per second			

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ANNEX C1. CIVIL PROJECT POINTS

Structures and Levees North of the Redline XY and Elevations

Levees

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
Perimeter Levee (L-624)									
FEB PT A	26 26 09.57	80 47 07.24	726408	764218		N/A	11.3	3	14
FEB PT B	26 29 35.06	80 47 10.89	726042	784965		N/A	11.3	3	14
FEB PT C	26 29 36.67	80 43 19.22	747089	785167		N/A	11.3	3	14
FEB PT D	26 28 43.91	80 43 18.16	747197	779841		N/A	11.3	3	14
FEB PT E	26 28 44.08	80 41 20.92	757850	779882		N/A	11.3	3	14
FEB PT F	26 26 10.15	80 41 18.82	758078	764341		N/A	11.3	3	14
Interior Levee (L-625)									
INT PT A	26 26 39.59	80 47 7.17	726409	767249		N/A	11	3	14
INT PT B	26 26 39.60	80 47 39.17	723501	767245		N/A	11	3	14
INT PT C	26 29 27.63	80 46 42.36	728635	784219		N/A	11	3	14

Canals

Description	Lat	Long	X	Y	Ground EL, NGVD	Canal Invert EL, NGVD	Depth ft	Bottom Width ft	Side slope Left	Side slope Right	Flow Rate CFS	
Inflow Canal (C-624)												
INF C PT A	26 26 8.82	80 46 53.99	727613	764144	9.0	-5.0	25.3*	20	2	2	1550	*Depth is from top of levee at 20.3 NGVD to invert elev at -5.0 NGVD. Canal inv at -5.0 to match
INF C PT B	26 29 27.27	80 46 57.31	727276	784180	9.0	-5.0	25.3	20	2	2	1550	inlet/outlet elevation of DS-5 sag culvert
Outflow Canal (C-625W)												
OC PT A	26 26 15.27	80 47 6.68	726458	764793	Existing	-5.0	21*	20	2.5	2.5	1550	*Top of bank at el. 16.0 NGVD
OC PT B	26 26 14.43	80 48 32.37	718669	764696	Existing	-5.0	21	20	2.5	2.5	1550	
OC PT C	26 26 8.42	80 48 32.22	718684	764089	Existing	-5.0	21	20	2.5	2.5	1550	
Spreader Canal (C-624E)												
SC PT A	26 29 45	80 47 10.55	785968	726071	9.0			250				
SC PT B	26 29 30.12	80 43 19.22	747091	784506	9.0			250				
Seepage Canal (C-626)												
SEC PT A	26 26 15.53	80 47 9.05	726243	764819	Existing	-5.5	14.5	15	2	2	-	
SEC PT B	26 29 37.70	80 47 12.57	725889	785231	Existing	-5.5	14.5	15	2	2	141.09	
SEC PT C	26 29 37.72	80 43 18.77	747130	785274	Existing	-5.5	14.5	15	2	2	282.19	
SEC PT D	26 28 44.85	80 41 20.13	757922	779960	Existing	-5.5	14.5	15	2	2	389.69	
Collection Canal (C-625E)												
CC PT A	26 26 8.15	80 41 20.40	757935	764139	Existing	0.0	9	10	2	2	400*	* FEB outflow will rely primarily on above ground flow; the collection canal only provides conveyance when the FEB
CC PT B	26 26 6.89	80 48 22.91	719530	763936	Existing	0.0	9	10	2	2	400	does not have a standing pool of water (i.e. only sheet flow)

Structures

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL, NGVD	Depth FT	Width FT	Structure Footer EL	Flow Rate CFS
DS-5 (S-624)	26 26 8.82	80 46 53.99	727613	764144	9.0	-5.0	11	11	-7.8	1550
DS-7 (S-625)*	26 26 15.27	80 47 6.68	726458	764793	9.0	0.0	9	9	-2.8	1550
DS-8**	26 26 14.66	80 48 43.37	717669	764718	9.0	-3.5*	16.5	35	-6	3700
PS-1 (S-626)	26 29 37.70	80 47 12.57	725889	785231	9.0	-5.5	N/A	N/A	-16.5	400
DS-9 (S-628)*	26 28 35.11	80 41 20.90	757854	778977	9.0	0.0	9	9	-2.8	930

DS-5: (2) 11'x11' box culverts (sag culverts with four 45 deg bends); deepest elev at -14.0 ft NGVD
DS-7: (3) 9'x9' box culverts
DS-8: (4) 35'x16.5' gated spillway
DS-9: (2) 9'x9' box culverts

*Crest invert elev = -3.5 ft NGVD; approach apron at elev. -13.5 ft NGVD

Description	Lat	Long	X	Y	Ground EL	Crest EL, NGVD	Crest FT	Flow Rate CFS
Overflow Weir (S-627)	26 28 39.61	80 41 21.0	757844	779431	9	13.5	14	3000

Structures and Degrade South of the Redline XY and Elevations

Levee Degrade

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
L-4 Degrade									
PT A	26 19 54.30	80 47 0.09	727122	726329					
PT B	26 19 53.42	80 49 38.39	712720	726219					

Canal Backfill

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
Miami Canal									
North	26 19 20.72	80 46 3.33	732292	722948					
South	26 08 49.09	80 38 00.87	776369	659277					

Canals

Description	Lat	Long	X	Y	Ground EL	Canal Invert EL	Depth	Width	Side slope Left	Side slope Right	Flow Rate CFS
L-5 Improvements											
L-5 PT A	26 20 12.36	80 32 11.83	807929	728365		-5.6		100			
L-5 PT B	26 19 53.79	80 38 3.53	775938	726388		-5.6		100			
L-5 PT C	26 19 55.02	80 46 28.86	729963	726407		-5.1		50			
Canal from Miami Canal to L-4											
C-8A	26 19 51.29	80 46 27.70	730069	726030							
C-8N	26 19 55.07	80 46 36.71	729249	726411							

Structures

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Depth FT	Width FT	Structure Footer EL	Flow Rate CFS
CS-1 (S-620)	26 20 12.36	80 32 11.83	807929	728365						
CS-2 (S-621)	26 20 25	80 32 50.10	804442	729629						
CS-2 (S-622)	26 19 53.79	80 38 3.53	775938	726388						
S-8A S	26 19 49.55	80 46 25.25	730292	725855						1020
S-8AW	26 19 51.29	80 46 27.70	730069	726030						3080
S-630	26 19 53.42	80 49 38.39	712720	726219						

Structures and Levees Green Blue Yellow Line XY and Elevations

Levees

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
L-67D									
PT A	25 52 43.96	80 36 36.74	784398	561995					
PT B	25 50 59.58	80 36 32.31	784834	551458					
PT C	25 45 41.38	80 36 21.53	785915	519337					

Canals

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
S-333 N Discharge Canal									
PT A	25 45 47.45	80 40 25.67	763593	519889					
PT B	25 45 44.81	80 40 18.58	764242	519624					
PT C	25 45 40.99	80 40 14.79	764590	519240					

Levee/Road Degrade

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Height	Side Slopes	Crown
L-29 Degrade									
PT A	25 45 41.38	80 36 21.53	785915	519337					
PT B	25 45 40.99	80 40 14.79	764590	519240					
L-67 EXT. Degrade									
PT A	25 45 40.22	80 40 25.09	763648	519159					
PT B	25 45 39.21	80 40 25.68	763594	519057					
PT C	25 41 17.92	80 40 16.05	764541	492681					
PT D	25 40 57.82	80 40 23.18	763893	490651					
Old Tamiami Trail									
PT A	25 45 39.38	80 40 26.76	763496	519074					

PT B	25 45 39.11	80 45 58.94	733127	518983					
L-67 C North Degrade									
PT A	25 53 50.08	80 34 23.98	796502	568708					
PT B	25 52 57.17	80 35 3.77	792885	563354					
L-67C South Degrade									
PT A	25 50 58.69	80 36 32.94	784777	551368					
PT B	25 46 5.84	80 40 13.49	764702	521748					
PT C	25 46 3.17	80 40 24.76	763673	521476					

Structures

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Depth FT	Width FT	Structure Footer EL	Flow Rate CFS
S-345C (S-633)	25 53 46.47	80 35 50.48	788604	568318						
S-345B (S-632)	25 49 40.91	80 38 56.18	771712	543479						
S-345A (S-631)	25 48 17.85	80 39 57.54	766105	543464						
L-29 Divide (S-355W)	25 45 41.38	80 36 21.53	785915	519337						
S-333 Add (S-333 N)	25 45 47.45	80 40 25.67	763593	519889						
S-356	25 45 42.81	80 30 8.54	820014	519597						
L-31N Seepage Wall										
PT A	25 45 38.63	80 29 51.50	821574	519181						
PT B	25 43 0.84	80 29 45.32	822200	503253						

Structure Removal

Description	Lat	Long	X	Y	Ground EL	Structure Invert EL	Depth FT	Diameter FT	Pipes Number
S-346	25 45 39.42	80 40 26.31	763537	519078					

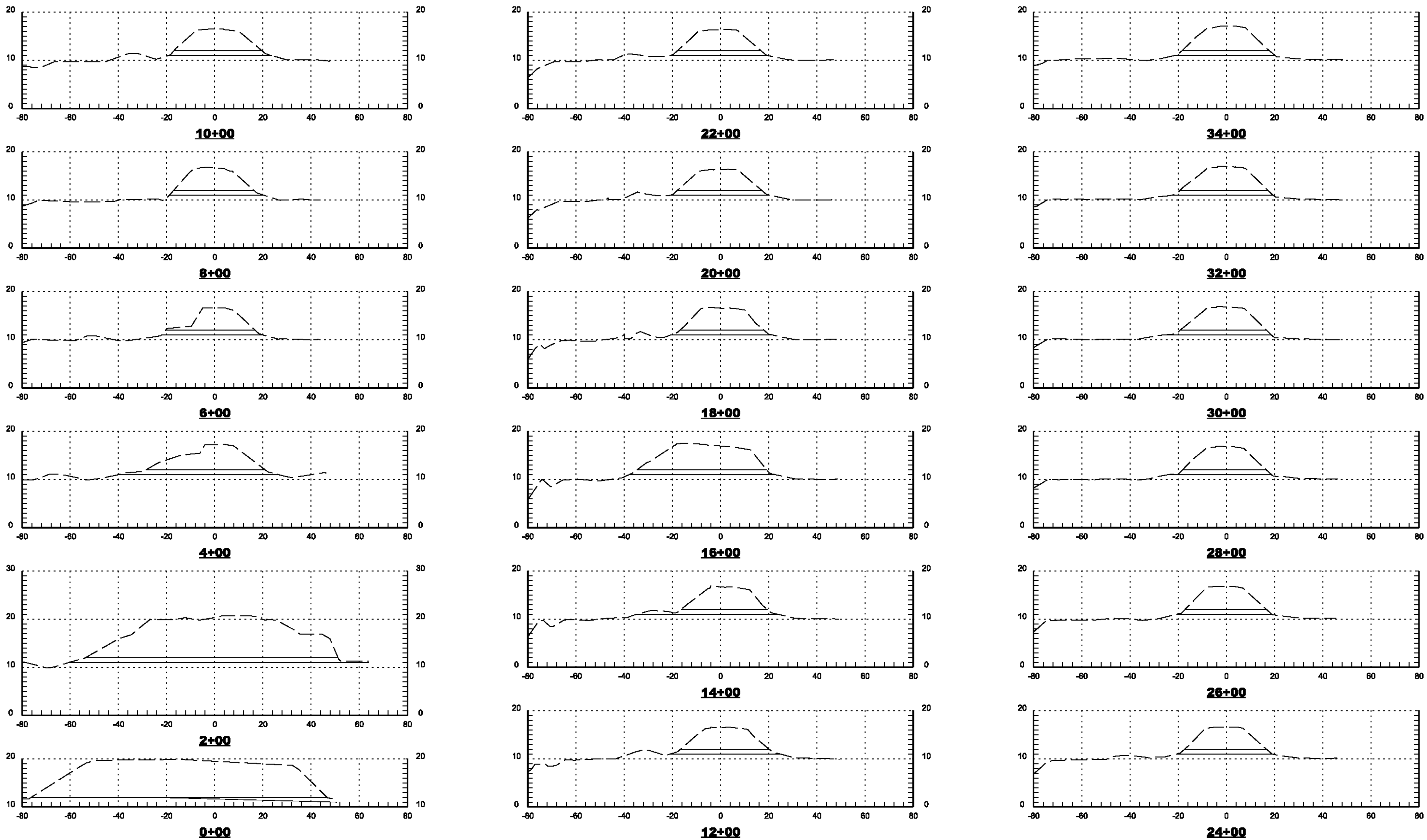
ANNEX C-2. CIVIL PLATES

L-4 Levee Cross Section

Typical Levee Cross Sections
(L-67A, L-67C, L-29, L-67D-Blue Shanty)

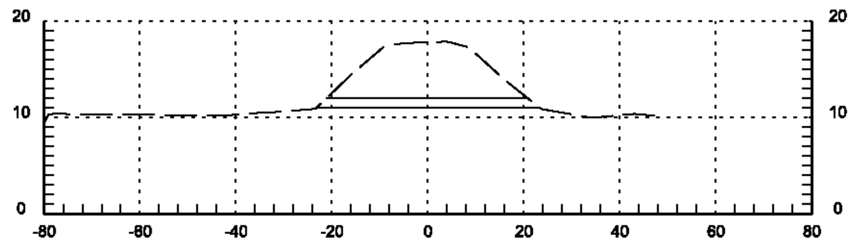
Miami Canal Backfill and Constructed Tree Islands (Mounds)
Initial Technical Recommendation
Ecological Recommendation

L-4 Levee Cross Sections (Stations start West at L-4/L-3 intersection then proceed East to S-8 Pump Station)



Elevation lines at 11' and 12' are shown, but elevation 10.5' is the quantity degrade elevation

L-4 Levee Cross Sections (Stations start West at L-4/L-3 intersection then proceed East to S-8 Pump Station)



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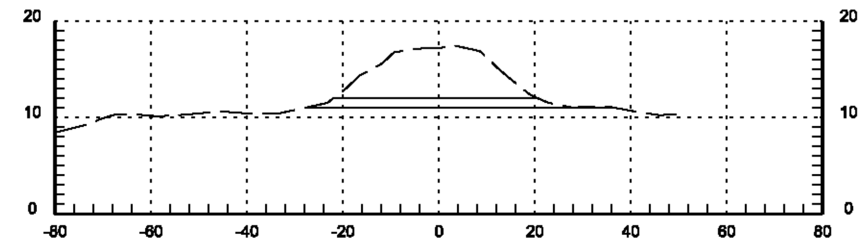

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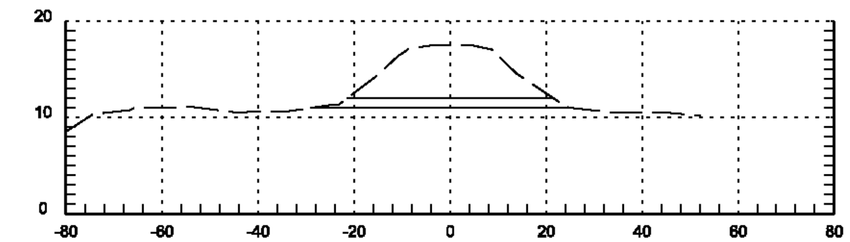

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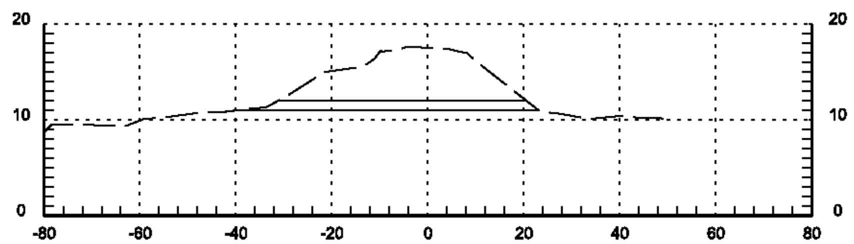

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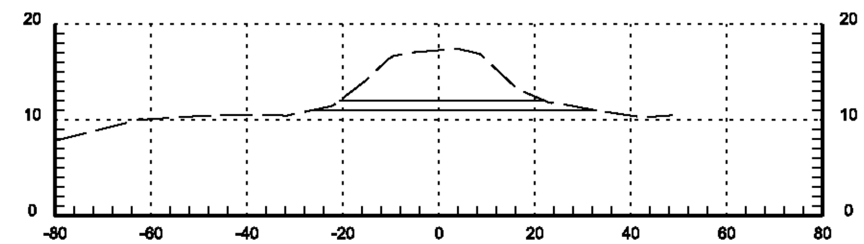

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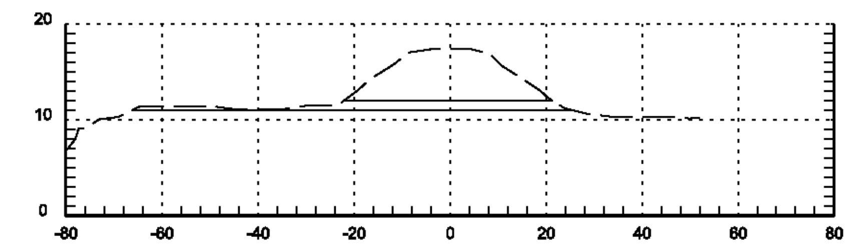

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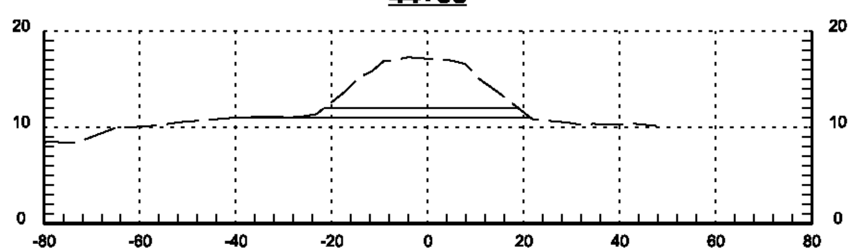

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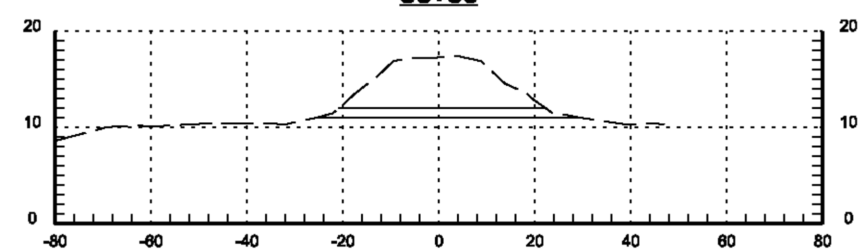

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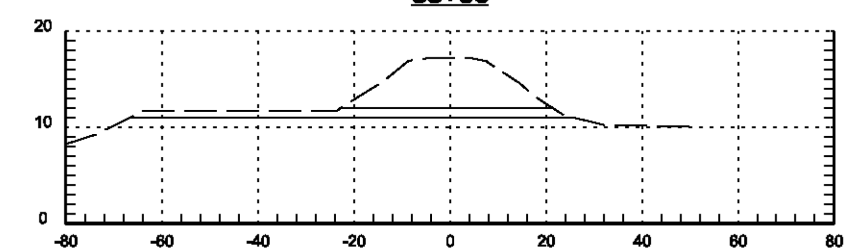

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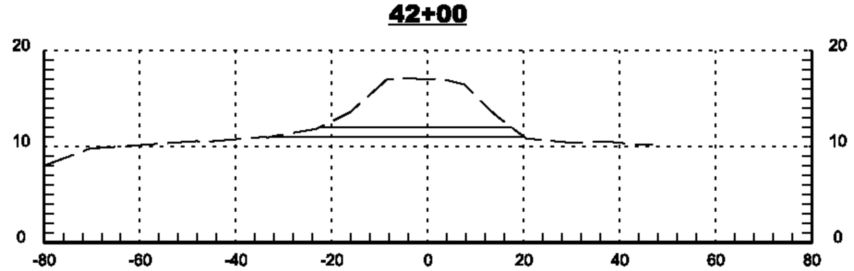

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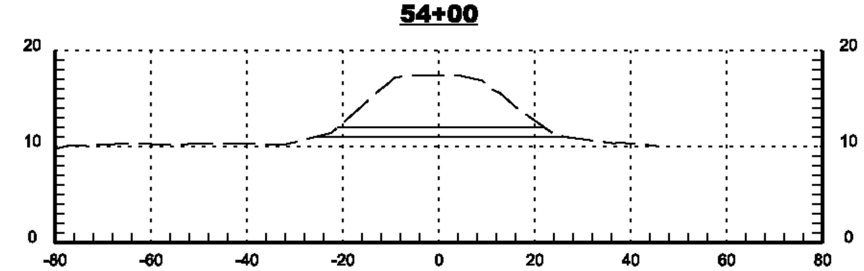

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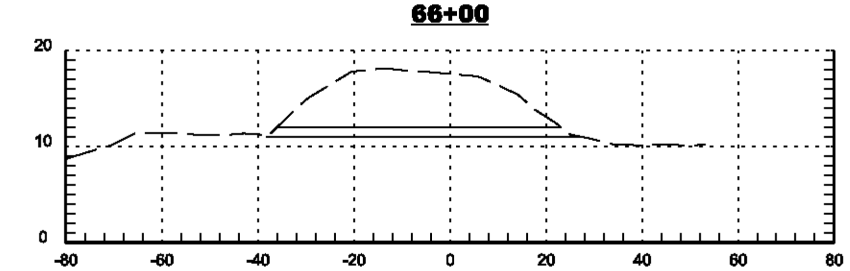

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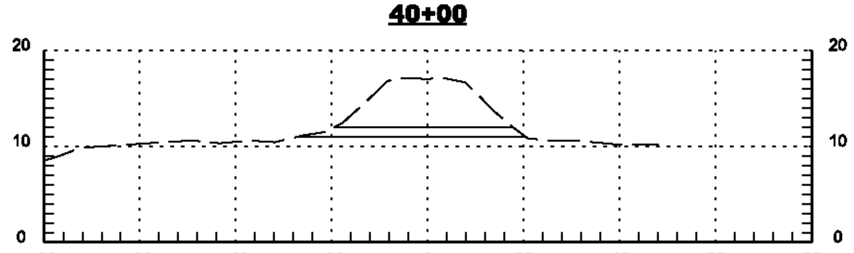

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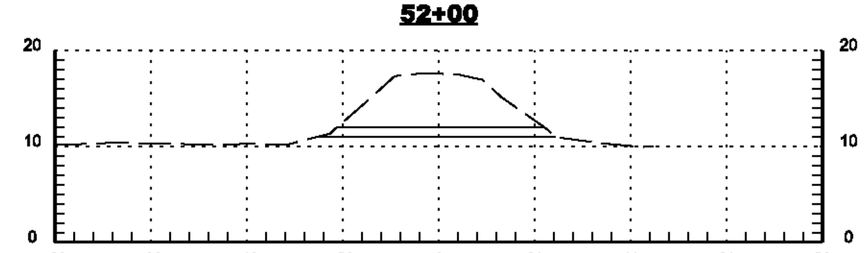

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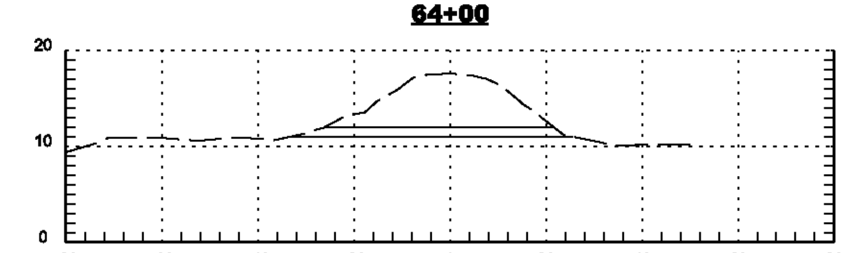

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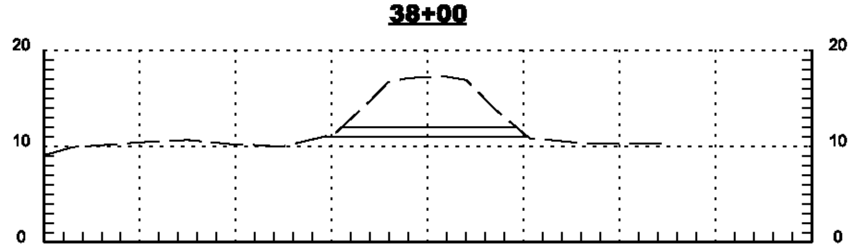

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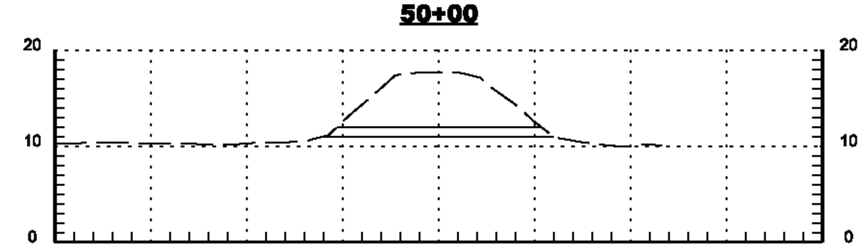

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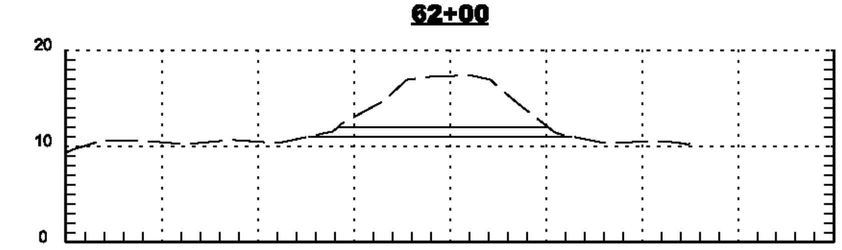

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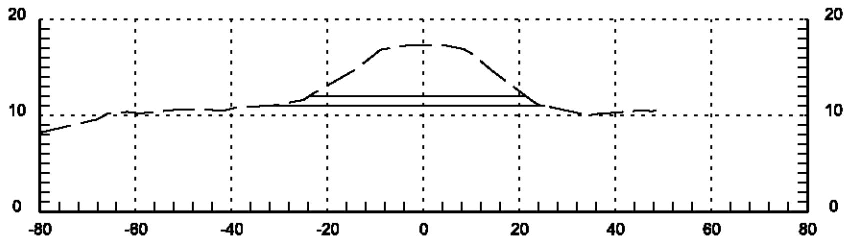
L-4 Levee Cross Sections (Stations start West at L-4/L-3 intersection then proceed East to S-8 Pump Station)



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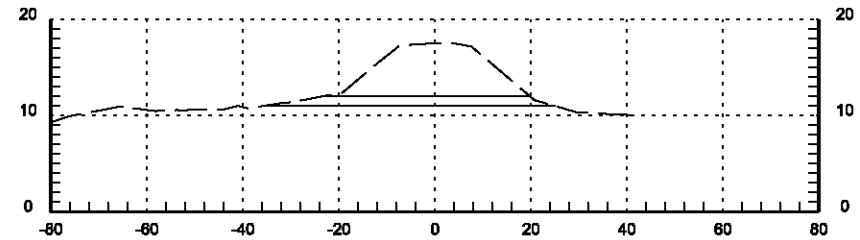

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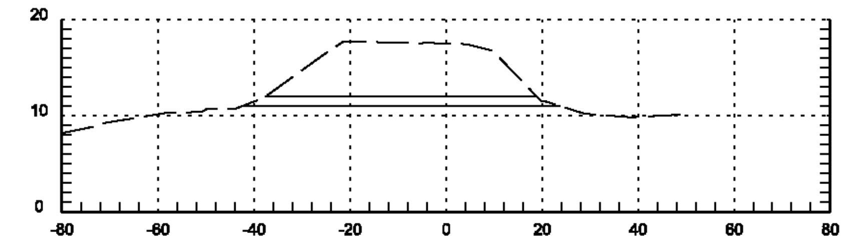

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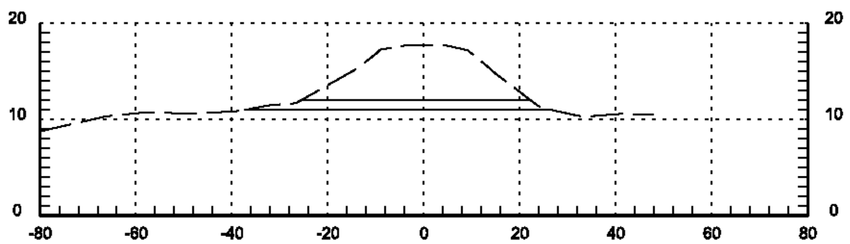

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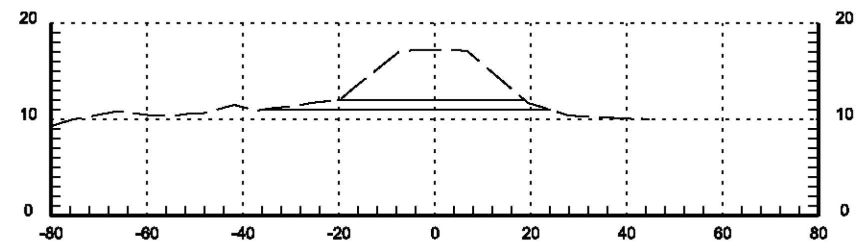

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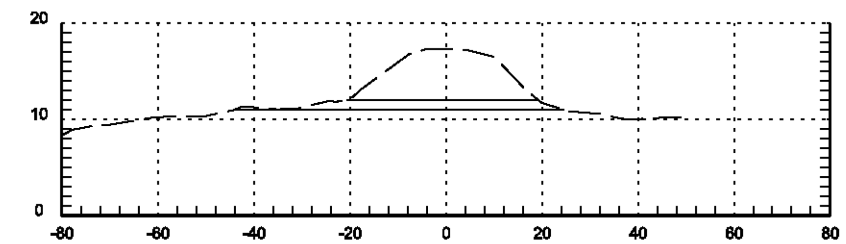

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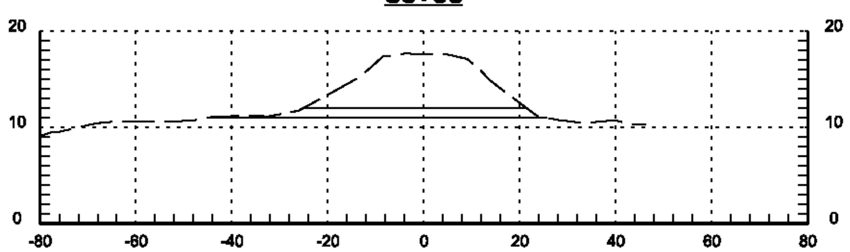

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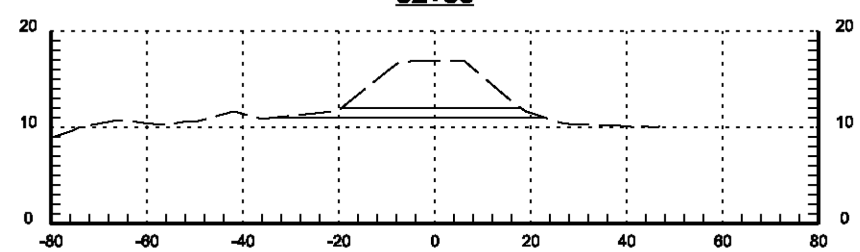

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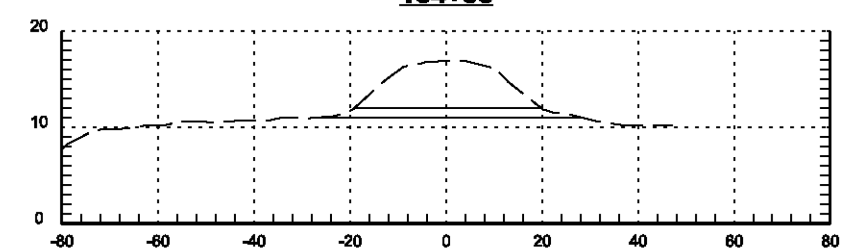

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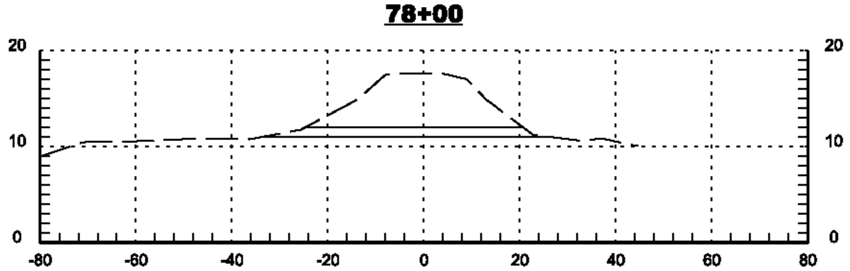

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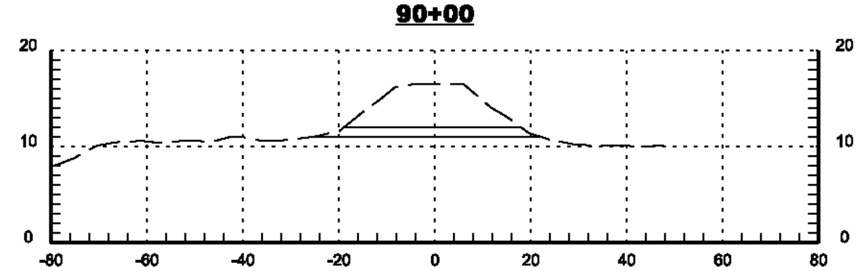

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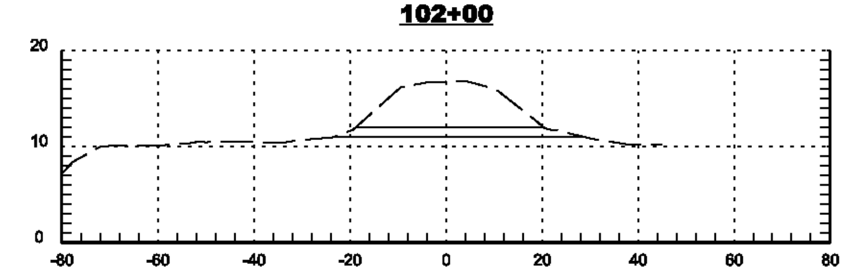

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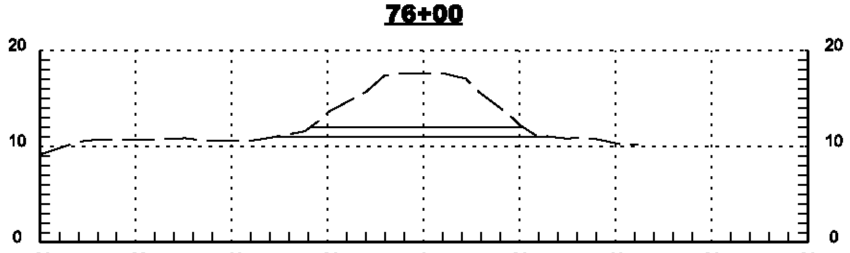

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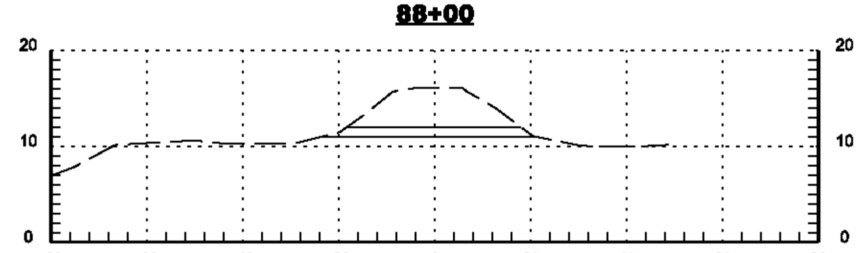

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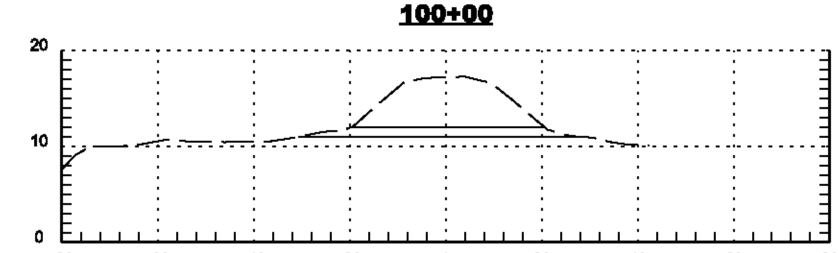

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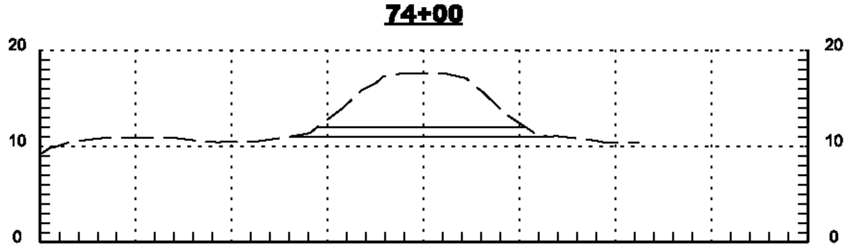

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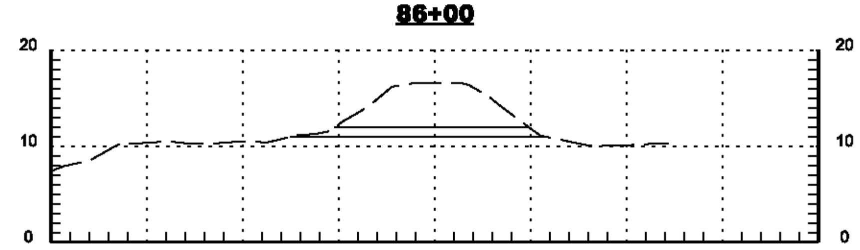

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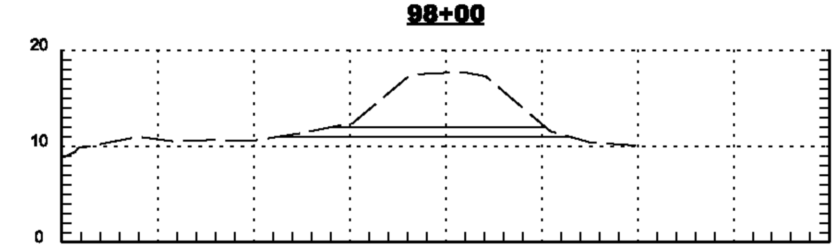

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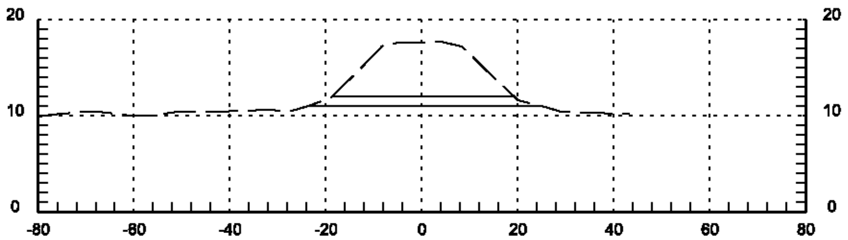
L-4 Levee Cross Sections (Stations start West at L-4/L-3 intersection then proceed East to S-8 Pump Station)



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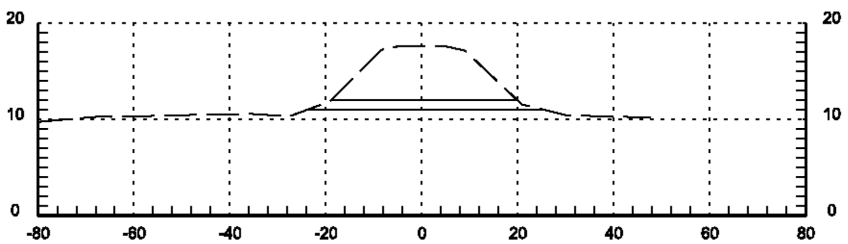

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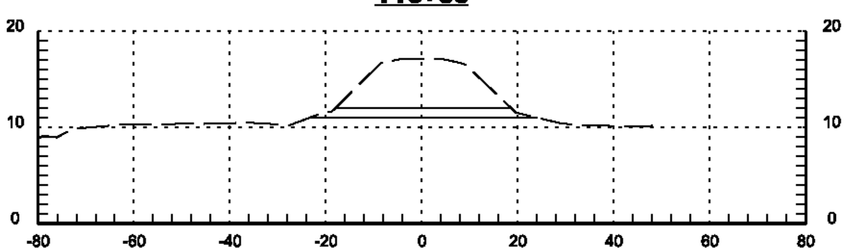

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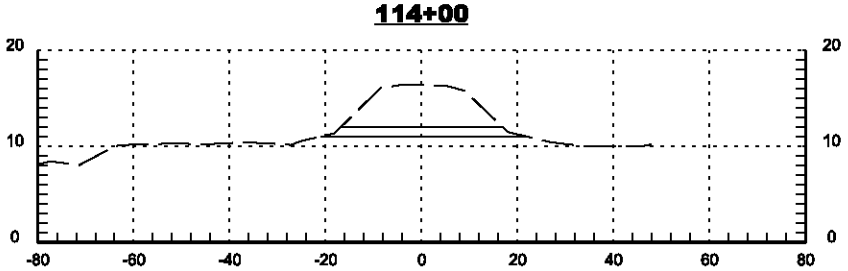

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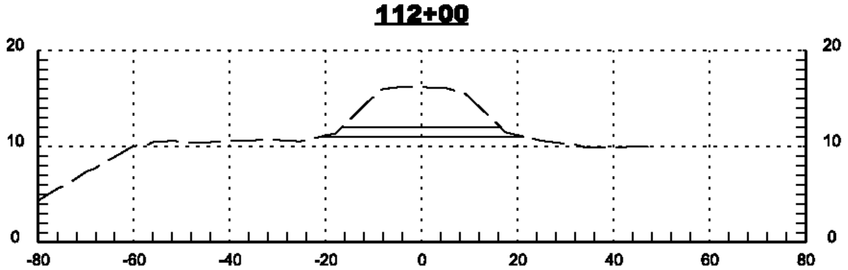

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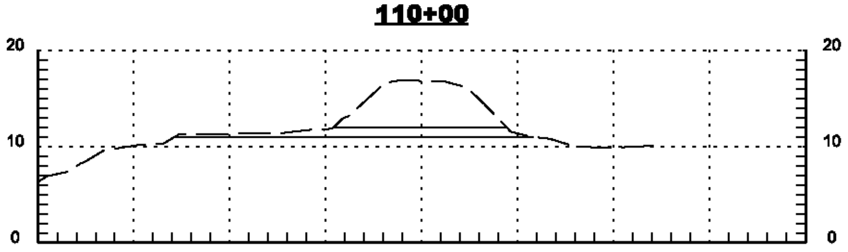

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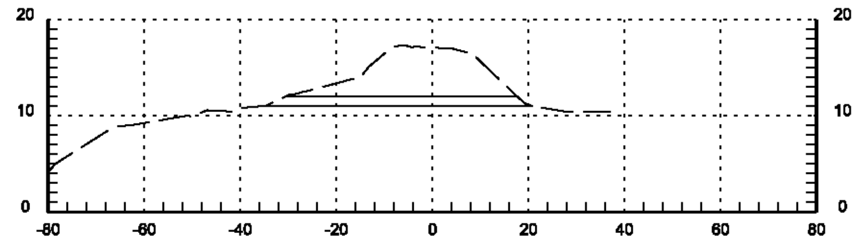

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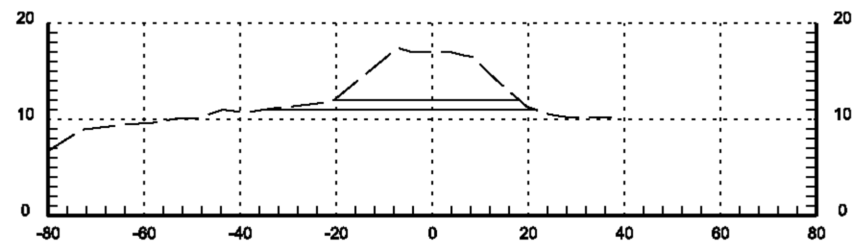

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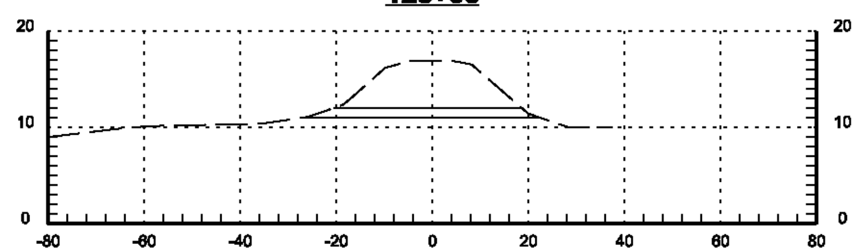

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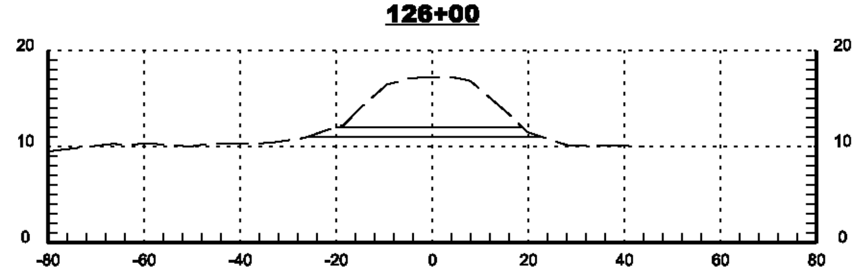

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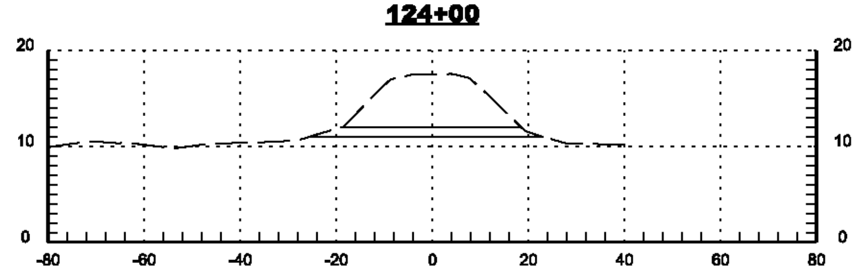

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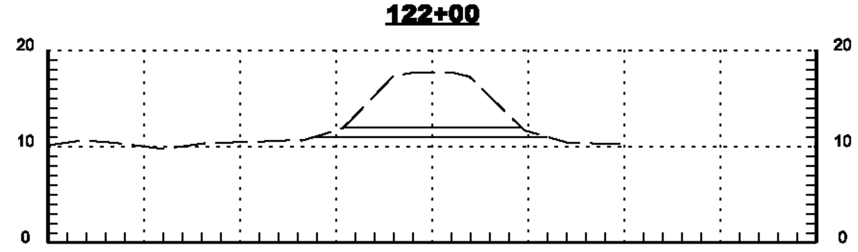

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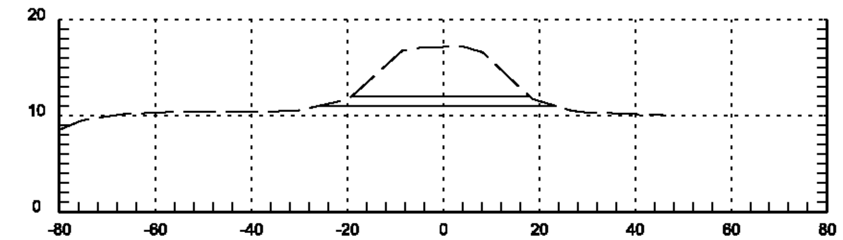

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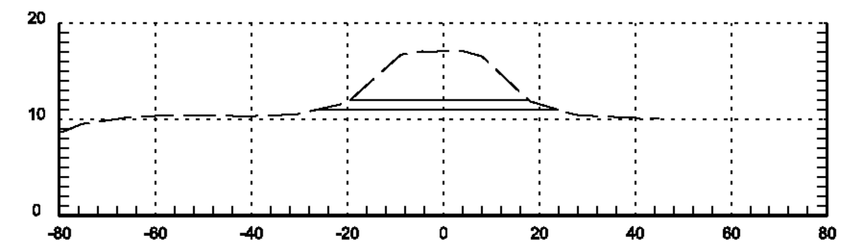

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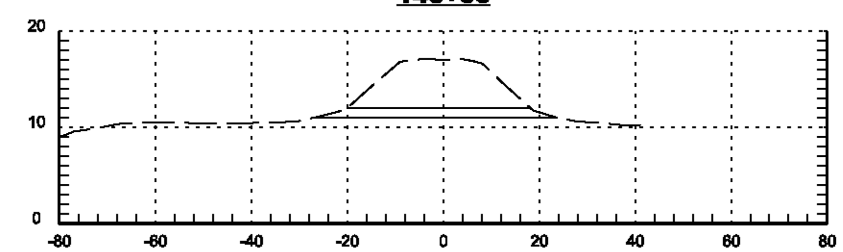

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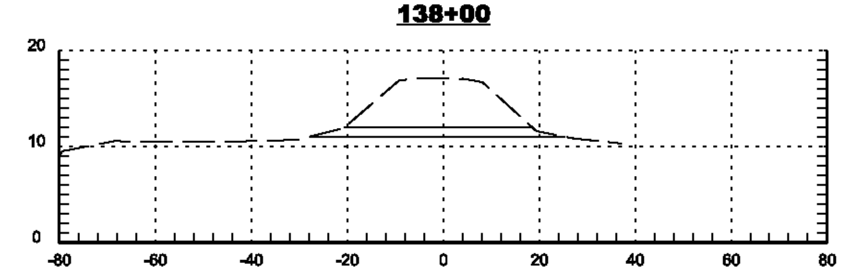

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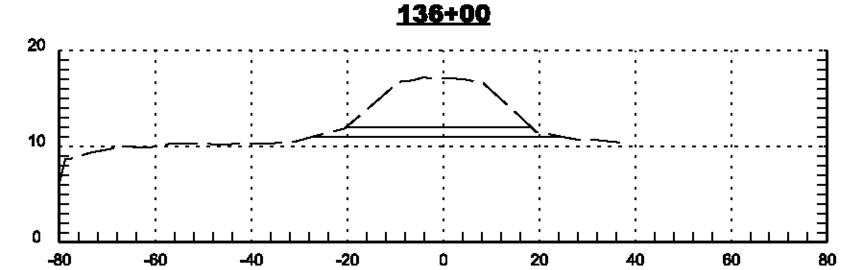

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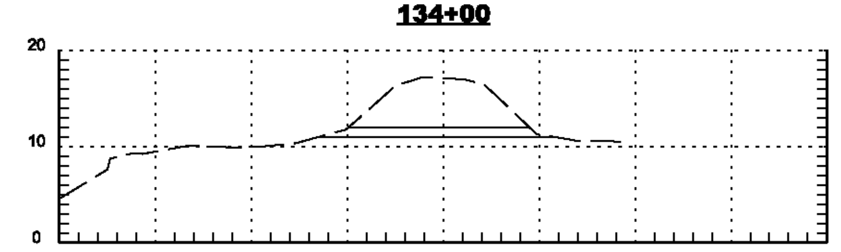

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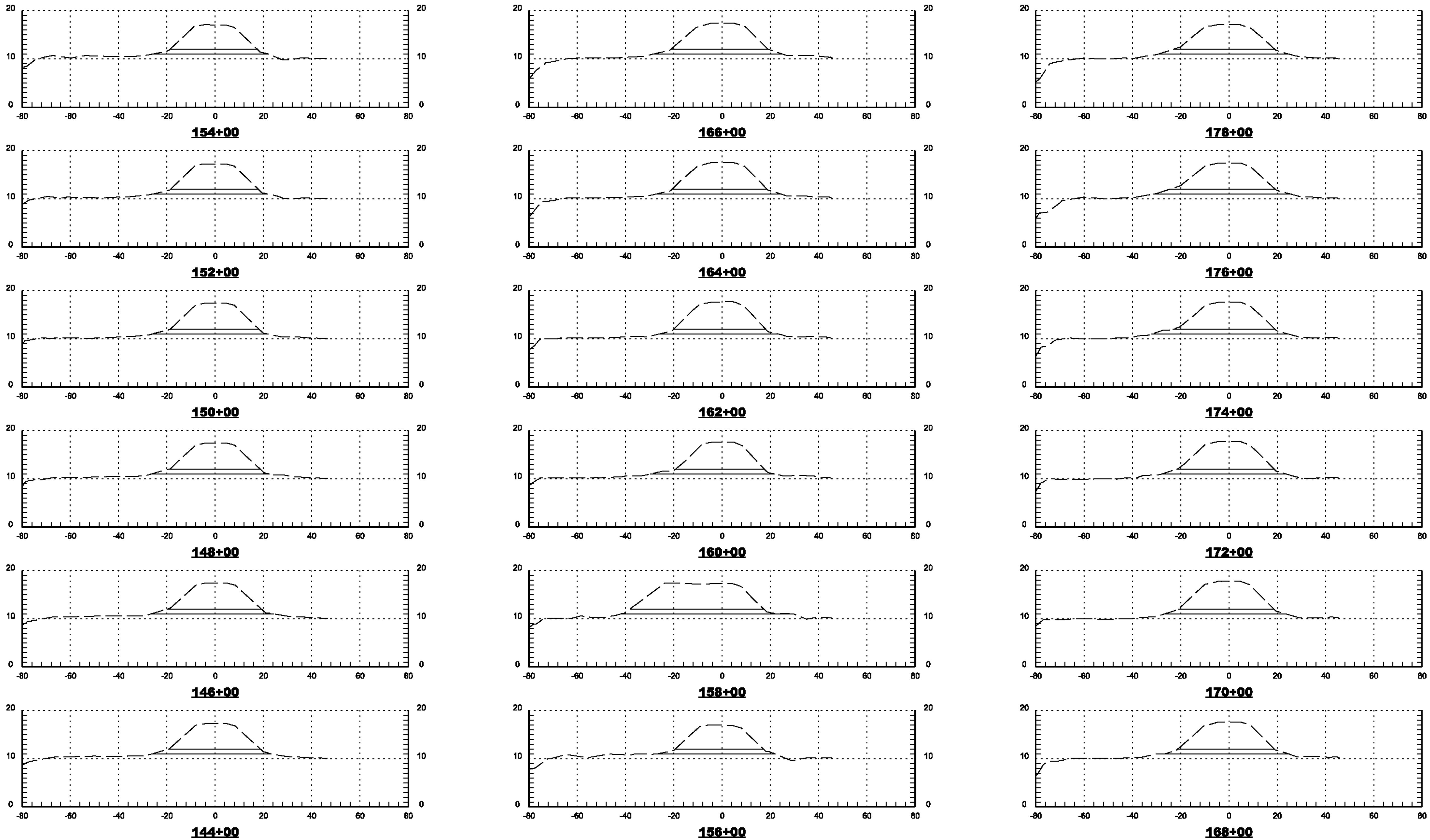
Elevation lines at 11' and 12' are shown, but elevation 10.5' is the quantity degrade elevation

L-4 Levee Cross Sections (Stations start West at L-4/L-3 intersection then proceed East to S-8 Pump Station)



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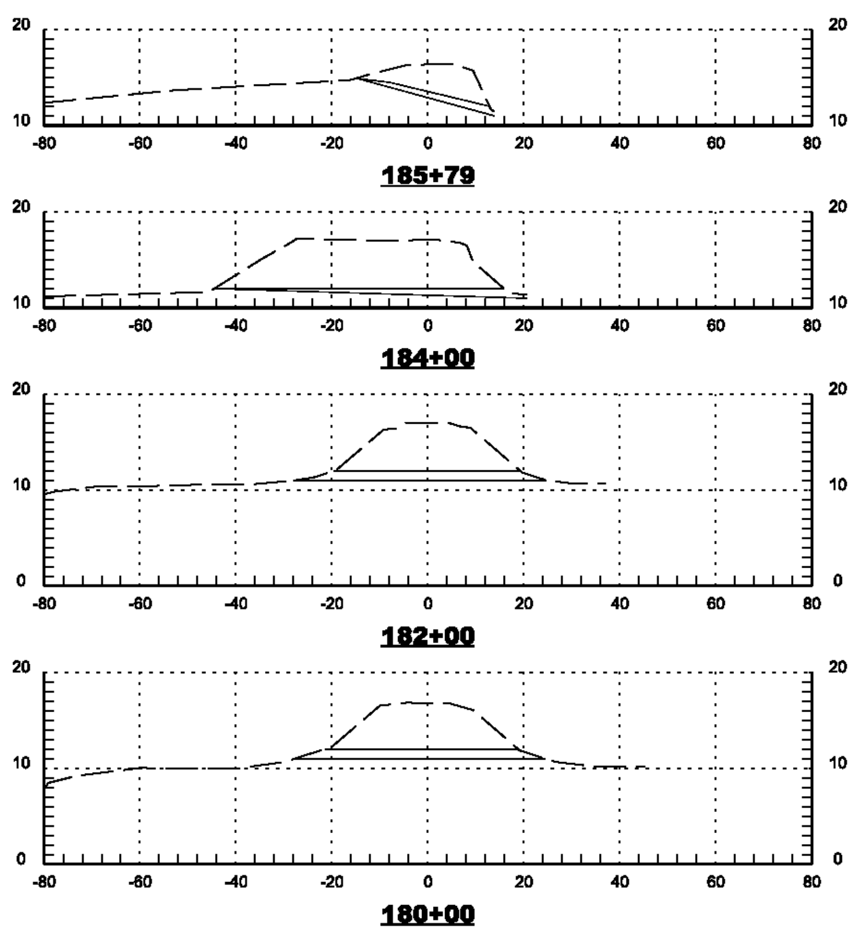

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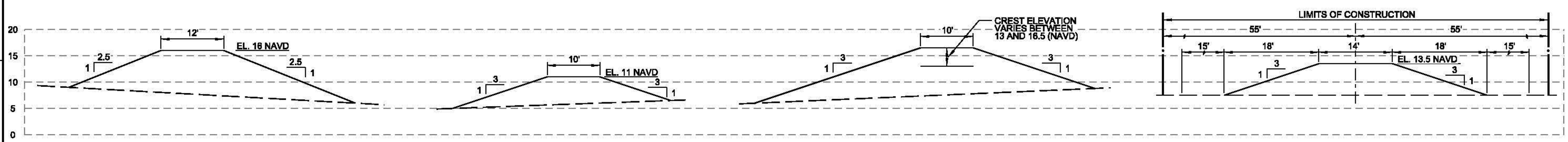


L-67 A LEVEE
SCALE: "A"

L-67 C LEVEE
SCALE: "A"

L-29 LEVEE
SCALE: "A"

CONCEPTUAL LEVEE IN 3B
(BLUE SHANTY LEVEE)
SCALE: "A"

NOTE:

LEVEE IS 6 FT. HIGH WITH 3:1 SIDE SLOPES MADE OF LIMEROCK/CLAYEY/SANDY MATERIAL. ASSUME 15 FT. SLOPED WOODY VEGETATION FREE ZONE ON BOTH SIDE OF LEVEE TOE.

GRAPHIC SCALES
"A" 10' 0 10' 20'

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

No.	SYMB	ZONE	Description

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: Dwn by: Ckd by: Inv. No. Date: DD MMM YYYY

CEPP-G-BS.DGN
Reference files:
File name:

CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
CENTRAL EVERGLADES PLANNING PROJECT

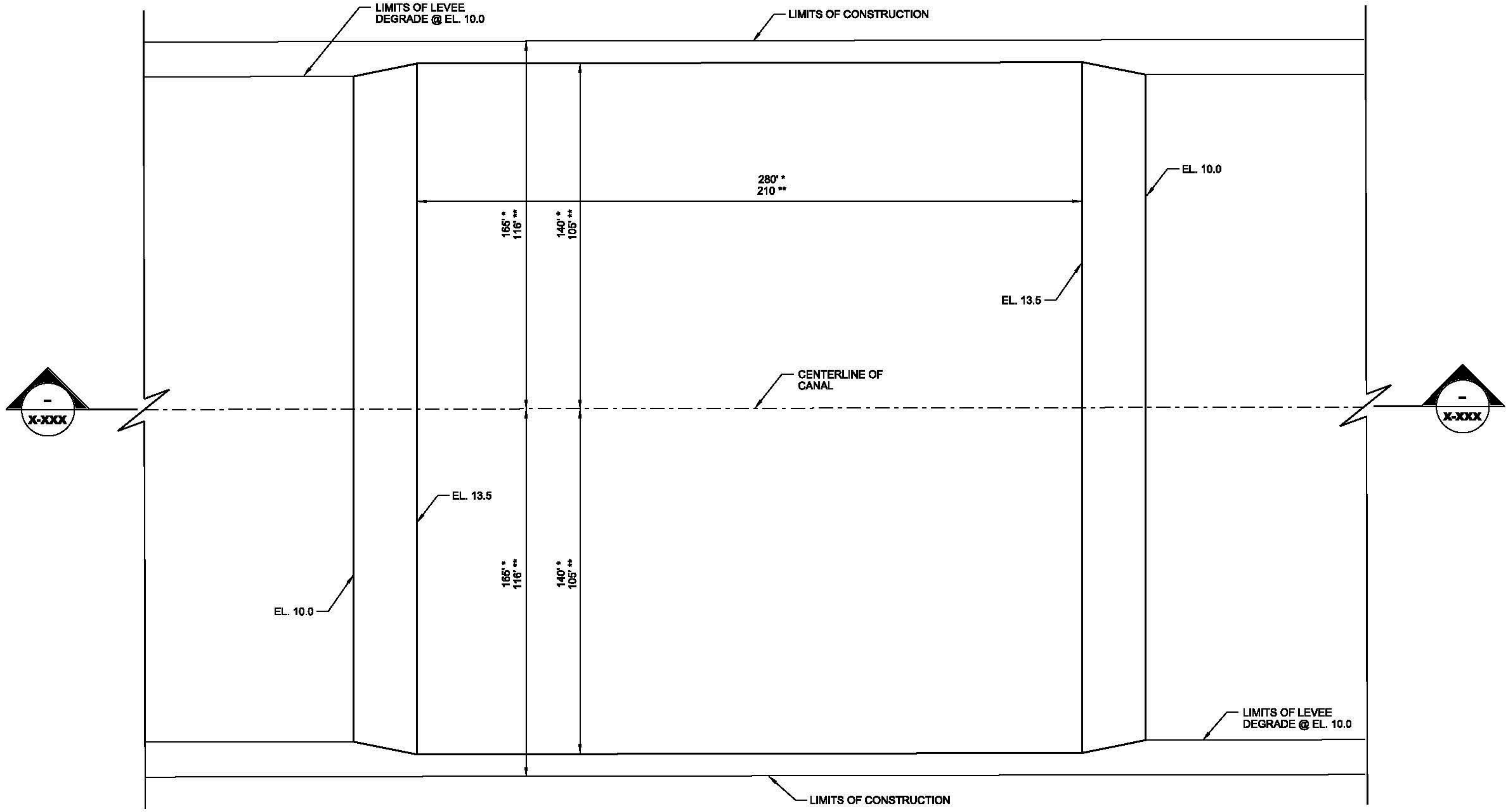
Scale: AS SHOWN
DRAWING NO.

auto_username auto_design

ANNEX C-2.1

MIAMI CANAL BACKFILL AND CONSTRUCTED TREE ISLANDS

Miami Canal Backfill and Constructed Tree Islands **(Mounds)**
Initial Technical Recommendation
Ecological Recommendation



TYPICAL SECTION - EARTHEN MOUND

SCALE: N.T.S.
STA. XX+XX.XX
STA. XX+XX.XX
STA. XX+XX.XX
STA. XX+XX.XX
STA. XX+XX.XX
STA. XX+XX.XX
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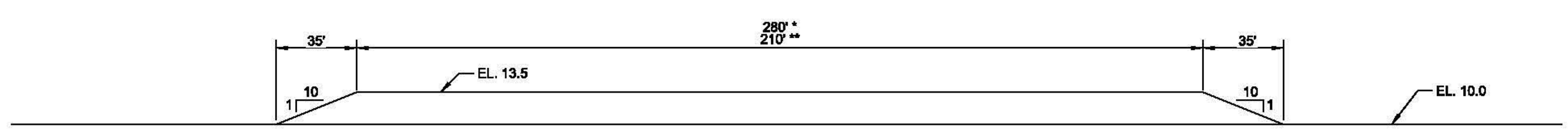


EARTHEN MOUND SECTION

SCALE: N.T.S.

US Army Corps
of Engineers
Jacksonville District

SAFETY ON THIS JOB
DEPENDS ON YOU

No.	SYMB	ZONE	Description

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by:
Ckd by:
Dwn by:
Inv. No.
Dated: DD MMM YYYY

CEPP-G-BS.DGN
Reference files:
File name:

CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
**CENTRAL EVERGLADES
PLANNING PROJECT**

Scale: AS SHOWN
DRAWING NO.

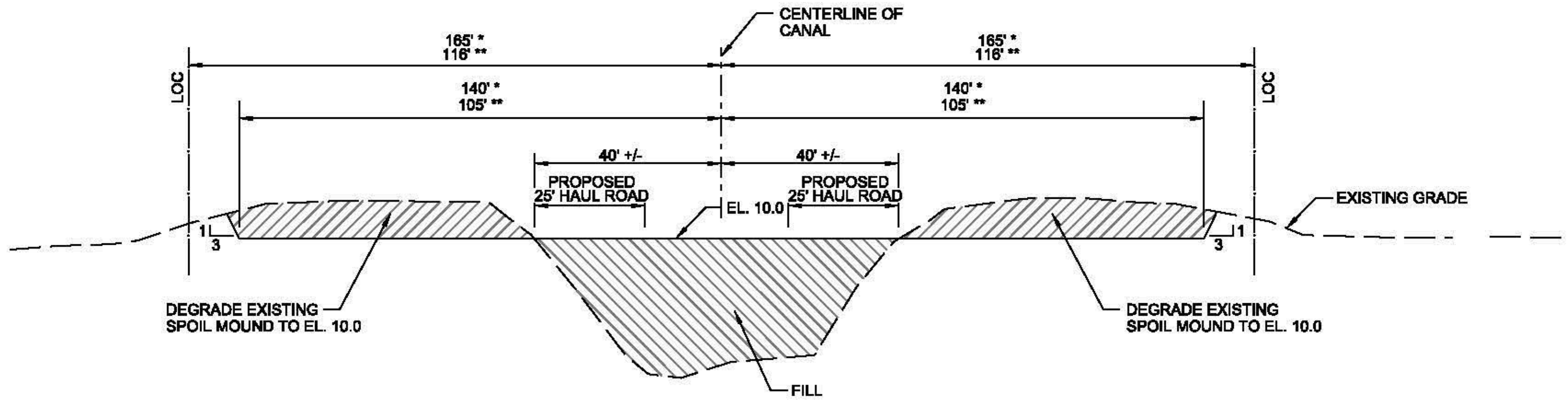
auto_username auto_design

LOC - LIMITS OF CONSTRUCTION
STA - STATION FOR MIAMI CANAL

INTENT IS TO MAINTAIN A BUFFER FROM EDGES OF SPOIL MOUND ~ 25 FEET SET AS LOC.

PROPOSED 1 MILE SPACING BETWEEN EARTHEN MOUND ABOVE 10' NAVD, ALONG THE MIAMI CANAL.

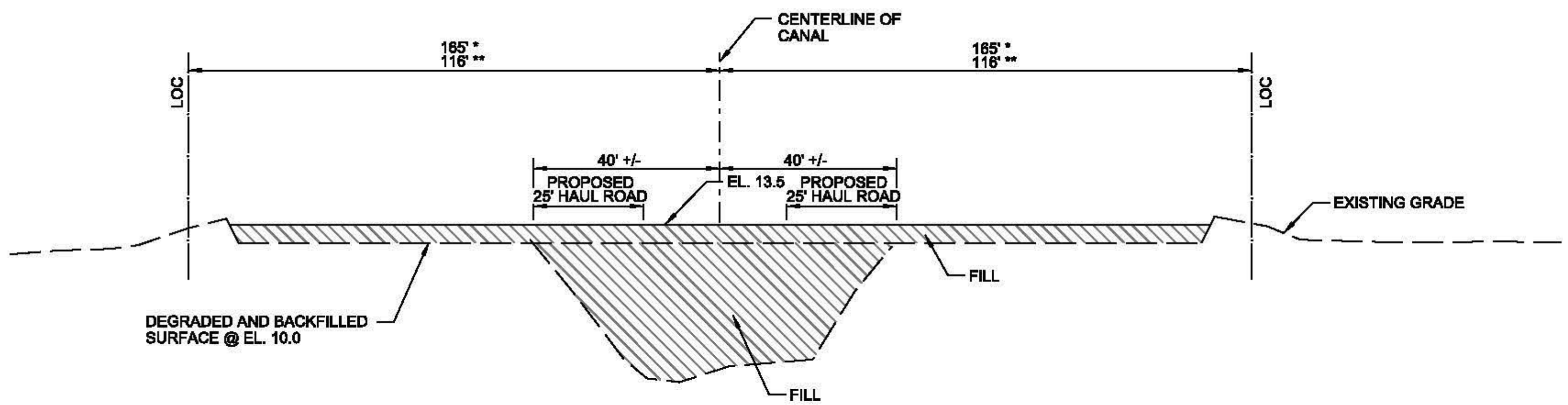
PROPOSED EARTHEN MOUND DIMENSION ARE 280x280 * & 210x210 ** FEET ALONG CANAL.



TYPICAL SECTION
CANAL BACKFILL AND SPOIL MOUND DEGRADE

SCALE: N.T.S.

* - STATION a10+00 TO STATION a176+00
** - STATION a176+00 TO STATION b605+00



SCALE: N.T.S.
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STA. XX+XX.XX
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STA. XX+XX.XX

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No	SYMB	ZONE	Description

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: Ckd by:
Dwn by:
Inv. No.
Dated: DD MMM YYYY

CEPP-G-BS.DGN
Reference files:
File name:

CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
CENTRAL EVERGLADES PLANNING PROJECT

Scale: AS SHOWN
DRAWING NO.

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Miami Canal Backfill and Constructed Tree Islands (Ecological Recommendation)

The goal of the Miami Canal Backfill is to render the canal hydrologically and ecologically invisible at the landscape scale and eliminate the harmful drainage effects that the Miami Canal has on the interior Everglades marsh that results in adverse effects on flora and fauna. The Miami Canal will be backfilled to bedrock from about a mile south of S-8 to S-339 and to about one foot above bedrock from S-339 to I-75 so that the backfill will be ~1.5 below the peat surface for the entire length of the backfill. This project element proposes to remove all spoil mounds on the east and west side of the Miami Canal from S-8 to S-339. From S-339 to I-75 all spoil mounds will be removed except for 22 FWC enhanced spoil mounds identified by FWC as the highest priority. In addition, this project element proposes to construct and create mounds approximately every one mile along the entire reach of the Miami canal (S-8 to I-75) where historic tree islands once existed. The remaining FWC spoil mounds will be incorporated into the constructed mounds that will be constructed along the ridges of the historic ridge and slough landscape to use as potential tree island generators. Refuge for fur-bearing animals and other upland species will continue to be provided by the retention of 22 of the highest priority FWC enhanced spoil mounds and the creation of additional upland landscape in the constructed tree islands approximately every mile along the entire reach of the Miami canal (S-8 to I-75).

Miami Canal constructed tree island design details will be determined during CEPP PED phase; because of the low level of detail available during the planning discussions, CEPP PED discussions regarding Miami Canal backfilling and tree island construction/planting must include appropriate science team members with expertise in these topics to accomplish the restoration vision and intent of CEPP's backfilling and tree island construction. Scientists included in the PED effort will bring information from Florida Fish and Wildlife Commission and Loxahatchee Impoundment Landscape Assessment (LILA) tree island design and planting projects, and other relevant efforts.

The constructed tree islands are intended to block flow down the backfilled canal with a series of constructed tree islands having a profile across the landscape that varies, or undulates, in elevation. The longitudinal cross section of this series of mound varies from marsh grade to ~1.5' above marsh grade. This undulated elevation will provide somewhat natural slopes for vegetation and wildlife, provide higher habitat for diverse plant and animal species that require such habitat, and provide low elevation slough areas between each island to promote natural water flow paths through the Everglades. It is also suggested that sloughs could be enhanced surrounding the tree islands to create fire breaks that mimic historic conditions to buffer the tree islands from fires. Part of the changes associated with drainage in the Everglades has been the loss of sloughs and their conversion to sawgrass. The historic slough condition resembled moats near the islands (Lodge, 2005) and may have been important for buffering against fires and delivering water and nutrients to the tree island species' roots. This concept was not thoroughly vetted during the CEPP team discussions but has been suggested for further consideration during CEPP design.

Construction of Tree Islands

Contractors should use local materials as much as possible, when doing so reduces costs. The Miami Canal will be filled to bedrock level with compacted fill material. This base layer does not include branches, trunks, or organic material. The layer of fill from the top of the bedrock to the elevation of the mound will include a wide range of grain and rock sizes as well as non-uniform, randomly placed, non-mulched branches and trunks from Miami Canal spoil material after consultation with FDEP during the PED phase. This layer would include a range of rock sizes to provide the needed porosity throughout the mound to the bedrock level. The goal is to have enough porosity for plant roots to be able to reach water through the mound material; this is an essential need for tree island creation. The end result should be rough terrain that is "difficult to walk on" (Figure C.2-1). The size of rock and volume will need to be specified, and there may be options to help alleviate compaction from machinery driving over the material; perhaps creating bigger planting holes to help plants have room to establish (see planting holes description below). The top layer of organic material is critical in the planting holes, where the plantings will be expected to root and grow. Organic muck should be spread 12" to 18" thick over the entire "high density" planting areas (defined below). Organic material spread 12'to 18"over the medium and low density planting areas of the island to promote native plant species recruitment on the islands is needed, but not as critical as in the high density planting areas. It remains to be determined whether the available muck will be clean and useable and, if not, whether it will be necessary to import material.

Creating planting holes and filling them with organic material will provide a rooting medium for the native plants and promote survival in harsh conditions without irrigation. The holes should be at least 1-ft diameter per tree; larger holes filled with organic material may boost survival. It is suggested that the hole depths can be a randomly distributed mixture of 1/3 each at 1', 2', 3' depths. Details can be determined during PED based on contracting capabilities. Depending on sequencing of construction, holes could be excavated and filled with muck for later planting; however, current knowledge suggests that creating and filling the holes without immediate planting may waste resources. Contractor capabilities should be considered and planting experts should be consulted again during detailed design phase to determine the best timing for digging, filling, and planting. As part of the final detailed design and contract development, the addition of a soil hydration polymer often used in agriculture and forestry, which is typically an adsorbant macromolecule granular powder that can be mixed into planting matter to limit soil water loss during dry periods should be considered. Such polymers can function for several years while plants' roots become established.

Tree Island Planting

The constructed tree islands will be planted using local plant sources to maintain Everglades genetic consistency among planted seedlings. All proposed plantings are assuming 3-gallon size plants. Immediately after planting, individual plants will be protected by ~3-ft metal exclosure, secured by metal stakes, to deter herbivores while the plants are becoming established. In high density planting areas, plants will be planted at ~6-ft on center spacing, along the northernmost and central area of each planted island. The high density area of the island should have 12-18" of organic material ("muck") spread on it before planting is conducted to provide decent growing condition for the plants; this organic material is a critical need for the high density planting area on the tree islands. In the medium density areas, plants will be planted at ~10-ft on center, starting from the high density planting southward about 75' and transitioning to "low density" planted island tail. If available the same depth of organic material should be spread in this area as in the high density area. In low density areas, plants will be planted at ~15-ft on center. If available the same depth of organic material should be spread in this area as in the high density area. Along the island perimeters, high density planting should be considered for the entire perimeter and tail of the tree islands to provide fire buffer between marsh and fire-sensitive tree island head. Species that can act as buffers include willow (*Salix caroliniana*) and pond apple (*Annona glabra*).

A diverse array of species will be planted, including trees, shrubs, and herbaceous species that are appropriate for these tree islands. The array will include a mix of faster-growing, desirable native species that will help to quickly create an environment on the constructed tree islands that is conducive for restoration, i.e., that will shade out weedy species and protect the organic layer on the island, will quickly develop root systems, and that will attract wildlife to the islands. Other desirable species that may grow more slowly will also be planted to result in the appropriate species composition for restored tree islands in this area. In addition, species will be chosen that are fire tolerant for the outer edges of the constructed tree islands to buffer the inner island area from wildfires. It is expected that the islands will accrue additional native species over time by natural recruitment. Currently FWC plants species such as hackberry (*Celtis laevigata*), strangler fig (*Ficus aurea*), sweet bay (*Magnolia virginiana*), red maple (*Acer rubrum*), dahoon holly (*Ilex cassine*), pop ash (*Fraxinus caroliniana*), Carolina willow (*Salix caroliniana*), elderberry (*Sambucus simpsonii*), bald cypress (*Taxodium distichum*), wild coffee (*Psychotria nervosa*), pond apple (*Annona glabra*), firebush (*Hamelia patens*), cocoplum (*Chrysobalanus icaco*), and myrsine (*Rapanea guinensis*), and these will be considered for the Miami Canal tree island mounds. Other beneficial species may be considered if needed.

Construction of the tree islands does not need to take place in the wet season, but planting needs to be done at beginning of the wet season to attempt to avoid irrigation. Irrigation options will be determined during detailed design when more is known about the construction sequencing for the mounds; for example, some existing FWC tree island planting contracts specify that all plants shall be watered at least once every two days for the first 2 weeks with a minimum of 1 gallon of water per plant and the vendor is responsible for transporting water or locating alternative water sources. However, it is uncertain at the current level of design and construction sequencing detail for the CEPP Miami Canal mounds whether such a requirement is feasible. If irrigation requirements are included in the planting contracts for the Miami Canal tree island mounds, the contracts should also specify that the need for watering will be determined by rainfall shortly after the planting. A survival percentage of planted seedlings should be included in the contractor specifications; currently FWC usually specifies a 90% survival rate at 4-6 weeks after planting. Considerations from work done by Miami Dade County include contracting a nursery to grow the plants to make them available for planting on the tree island mounds, because growing to 3-gal size is an investment for the nursery and they may need assurance that someone will buy the plants. Doing so will ensure that plants will be available at the time and in the size needed. This may require funding to be guaranteed over consecutive years (~3 years) until the plants are obtained.

Dimensions and Slope of Islands from S-8 to S-339

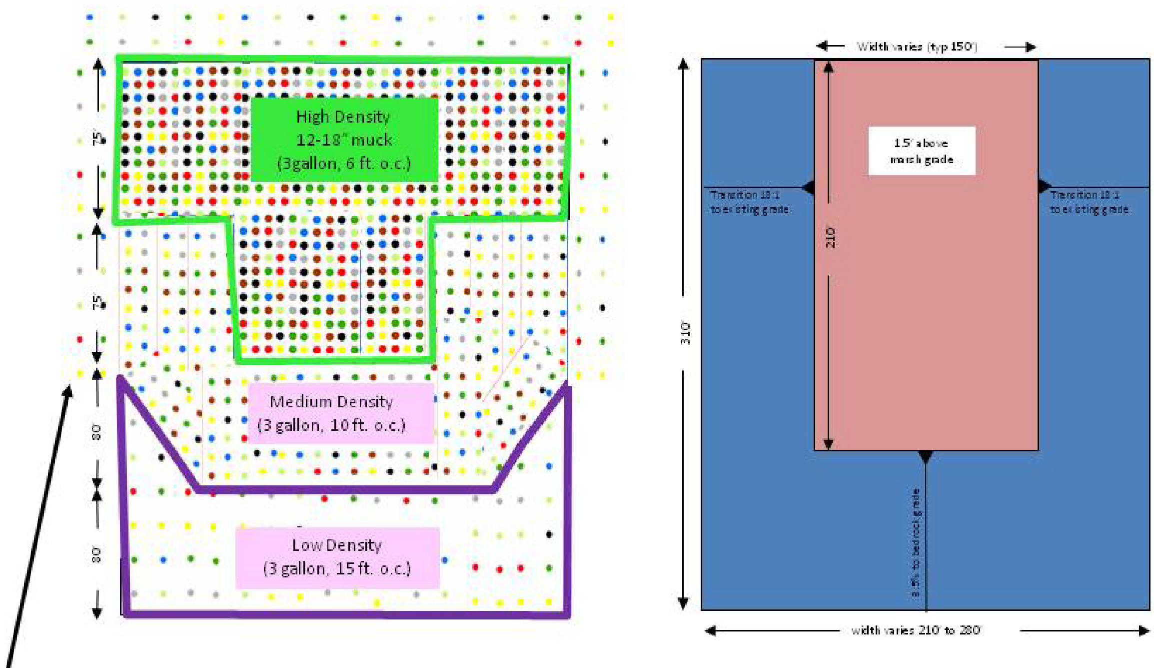
The constructed tree islands from S-8 to S-339 will have a total width of 210’ and overall length of 310’. The flat area should be 1.5’ above marsh grade, 150’ wide by 210’ long, with no steeper than a 18:1 transition to marsh grade on the east and west sides and 1.5% to marsh grade along the tail (south side). The north side of the island can be as steep as feasible from a construction perspective (Figure C.2-2). Suggested slopes result in more natural grade and longer islands, which is not anticipated to require additional fill material because the material needed to create the length will come from the slopes less steep than originally suggested. The intent is to maintain the number of proposed tree islands using available fill but to make the tail end sloped to provide a more natural shape and lengthen the islands.

Dimensions and Slope of Islands from S-339 to I-75

The dimensions of the constructed tree islands from S-339 to I-75 are adjusted slightly from that described above to partner the constructed islands with the remaining portions of the FWC planted tree islands. These constructed mounds can be approximately 500’ or 1500’ long, depending on the linear extent of adjacent FWC Island maintained (Figure C.2-3 and Figure C.2-4). For areas with a FWC Island on one side of the mound each mound will have at its northern end a flat portion, raised 1.5’ above marsh grade, that abuts and transition into the adjacent, existing FWC Island. The flat portion will transition at 20:1 down to marsh grade, on the marsh side (opposite FWC Island) and 1% to 1’ below marsh grade on the “tail” side. For areas with FWC Islands on both sides of the mound (500’ length), the head of the mound will be 1.5’ above marsh grade in the center, and be graded up at 18:1 on both sides to transition into the sides of the FWC Islands on both sides. The tail of the island will have a center at marsh grade, with similar upward 18:1 slopes (both sides) to transition into adjacent FWC islands. For areas with FWC Islands on both sides of the mound (1500’ length), the mound configuration will be 3 of the above described 500’ lengths in series. The two northern mound tails will transition to mash grade, and the southern mound tail will transition to bedrock grade.

Figure C.2-1. LILA construction photos as an example of the surface desired.

Constructed Tree Islands S-8 to S-339



Willow & pond apple along perimeter edge of tree island, and tail of tree island.

Example Quantity Estimate				
	Density			
High	Medium	Low	Total	
36	100	225	64	sf/tree
27,000	18,900	24,200	70,100	total area
750	189	108	1,047	# of trees
39%	27%	35%	100%	% coverage

Figure C.2-2. Representation of recommended constructed tree islands from S-8 to S-339

Constructed Tree Islands S-339 to I-75
(FWC mounds on west side only)

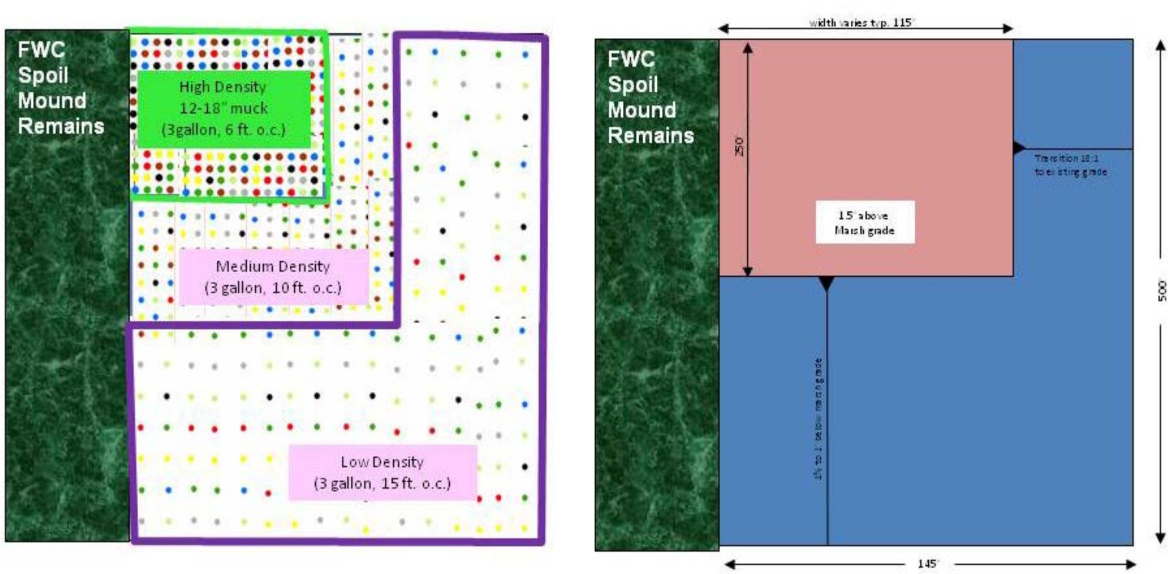


Figure C.2-3. Constructed tree island from S-339 to I-75 with a FWC spoil mound remaining on the west side.

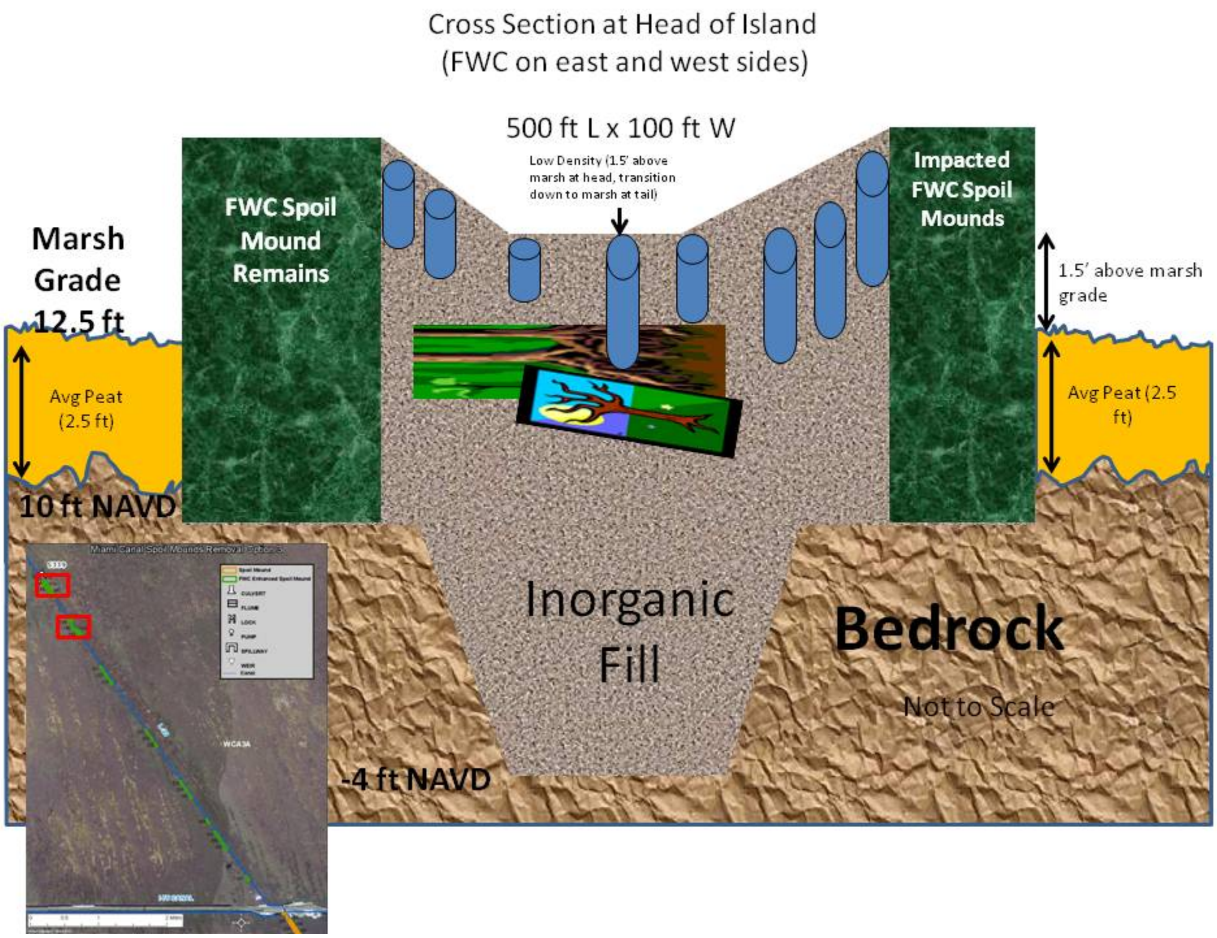
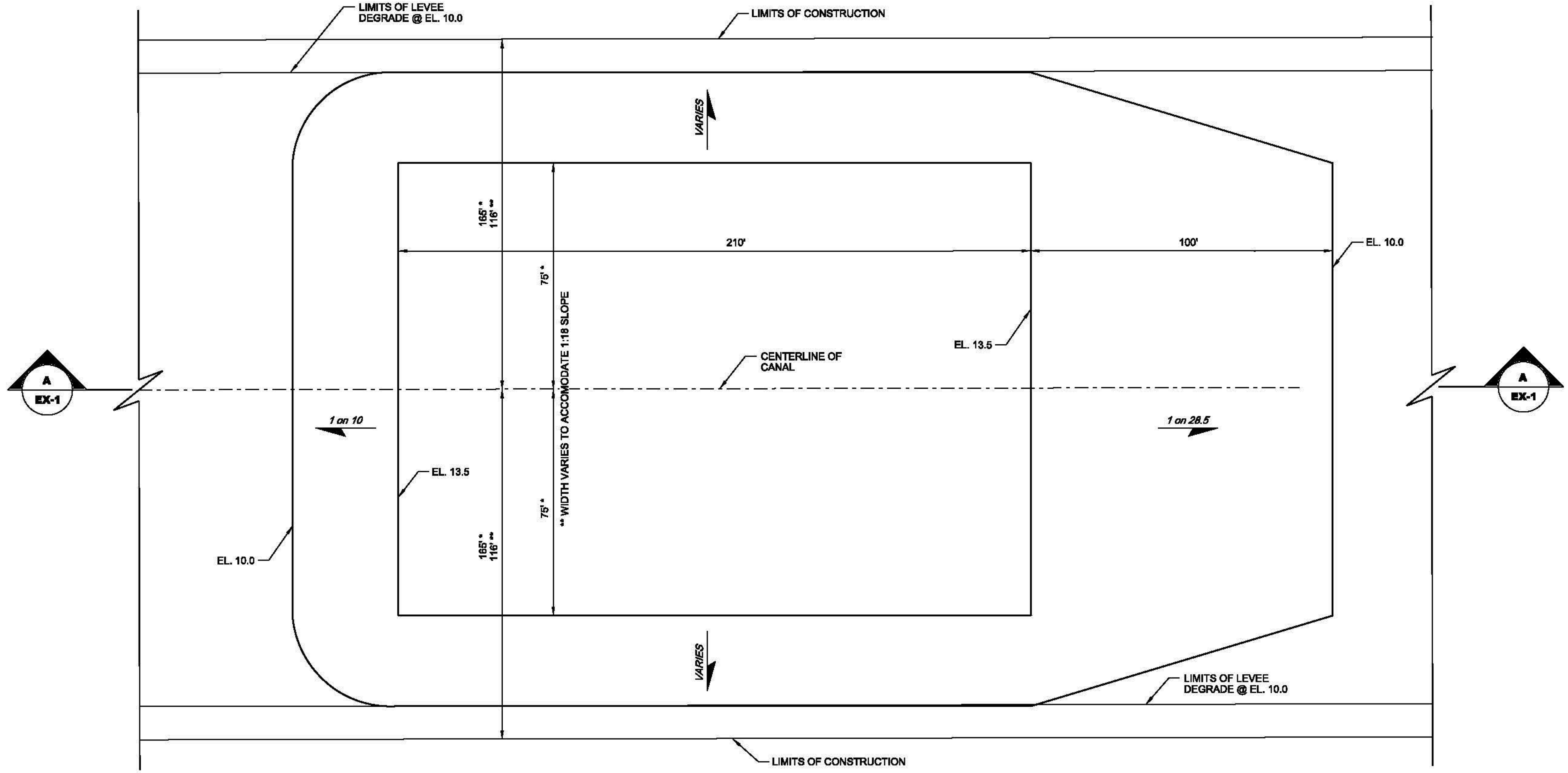


Figure C.2-4. Constructed tree island cross section from S-339 to I-75 with FWC spoil mounds remaining on the east and west sides.

See Engineering Plates EX-1 and EX-2.

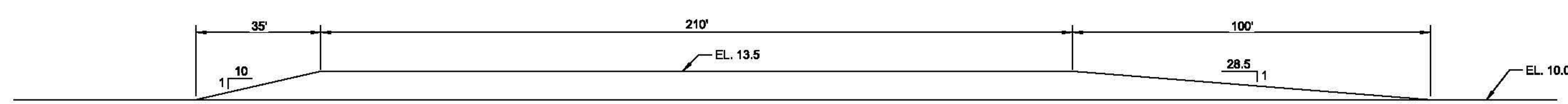
References

Lodge, T. E. 2005. The Everglades Handbook: Understanding the Ecosystem, Third Edition. CRC Press, Boca Raton, FL.



TYPICAL SECTION - CONSTRUCTED TREE ISLAND

SCALE: N.T.S.



A / EX-1 **CONSTRUCTED TREE ISLAND**

SCALE: N.T.S.

US Army Corps of Engineers
Jacksonville District

SAFETY ON THIS JOB DEPENDS ON YOU

No. | SYMB | ZONE | Description

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: | Ckd by:
Dwn by:
Inv. No.
Dated: DD MMM YYYY

CEPP-G-BS.DGN
Reference files:
File name:

CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
CENTRAL EVERGLADES PLANNING PROJECT

ECOLOGICAL RECOMMENDATION

Scale: AS SHOWN

DRAWING NO.

EX-1

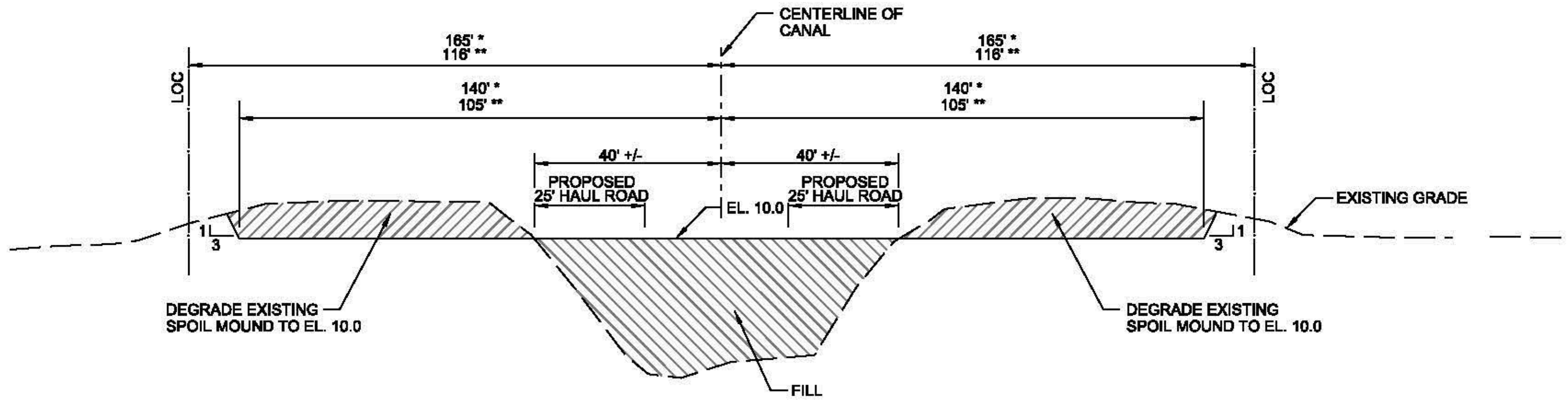
auto_username auto_design

LOC - LIMITS OF CONSTRUCTION
STA - STATION FOR MIAMI CANAL

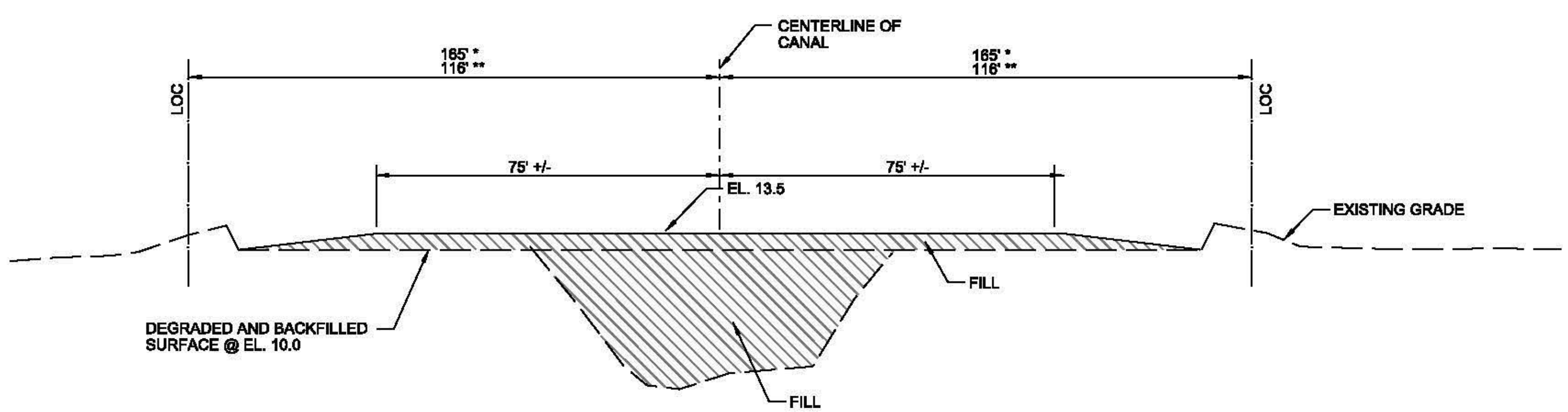
INTENT IS TO MAINTAIN A BUFFER FROM EDGES OF SPOIL MOUND ~ 25 FEET SET AS LOC.

PROPOSED 1 MILE SPACING BETWEEN CONSTRUCTED TREE ISLANDS ABOVE 10' NAVD, ALONG THE MIAMI CANAL.

PROPOSED CONSTRUCTED TREE ISLAND DIMENSIONS ARE *(150x310). 1:18 SLOPES AND **(<100'-VARYING WIDTH x LENGTH RANGING FROM 310' TO 1000' 1:18 SLOPES ALONG CANAL.



TYPICAL SECTION
CANAL BACKFILL AND SPOIL MOUND DEGRADE
SCALE: N.T.S.
* - STATION a10+00 TO STATION a176+00
** - STATION a176+00 TO STATION b605+00



TYPICAL SECTION
CANAL BACKFILL AND CONSTRUCTED TREE ISLAND
SCALE: N.T.S.

US Army Corps of Engineers
Jacksonville District
SAFETY ON THIS JOB DEPENDS ON YOU

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

Designed by: Ckd by:
Dwn by:
Inv. No.
Dated: DD MMM YYYY

CEPP-G-BS.DGN
Reference files:
File name:

CENTRAL & SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
CENTRAL EVERGLADES PLANNING PROJECT

ECOLOGICAL RECOMMENDATION

Scale: AS SHOWN
DRAWING NO.
EX-2

auto_username auto_design

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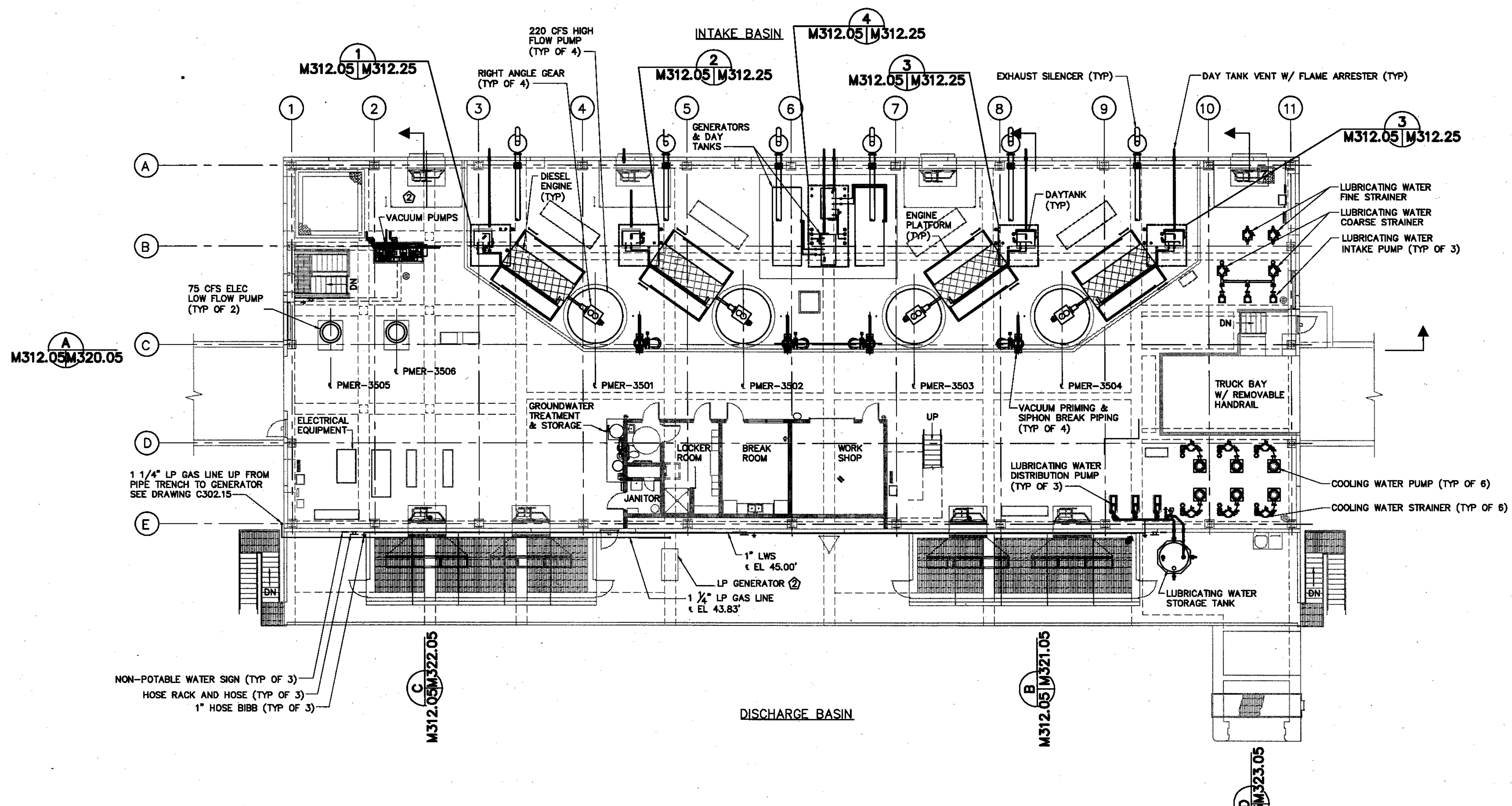
ANNEX D1-Mechanical Plates



OPERATIONS LEVEL PLAN - EL 27.00

8 4 0 8 16

SCALE: 3/32"=1'-0"

NOTE:
ALL FLOOR SUPPORTS FOR PIPING, VENTS AND EXHAUSTS SHALL BE ELEVATED ON HOUSE KEEPING PADS. SEE M051.10 FOR REQUIREMENTS.

The consultant, contractor or other parties associated with this project shall comply with Florida Statutes 119.07 (8) (c). These plans are the property of the United States Army Corps of Engineers and must be secured and maintained in a confidential manner. Review by any unauthorized individual or outside/third party not performing work necessary for this project is prohibited.

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DATE:
ENGINEER OF RECORD: Troy John V. Perella, P.E.
FL ENGINEERING LICENSE NO.: 58138

REV.#	E.O.R.	DATE	REVISION DESCRIPTION
2	SAC		REVISED TO ACCOMPANY AMENDMENT NO. 0004 - SEPT 2009 ZONES D4 & E6
1	SAC	06/06/06	FOR ADVERTISING

ENGINEER: TJP
DRAWN: WAH
CHECKED: LF
DATE: 12/23/05
SCALE: AS SHOWN

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

US ARMY CORPS OF ENGINEERS
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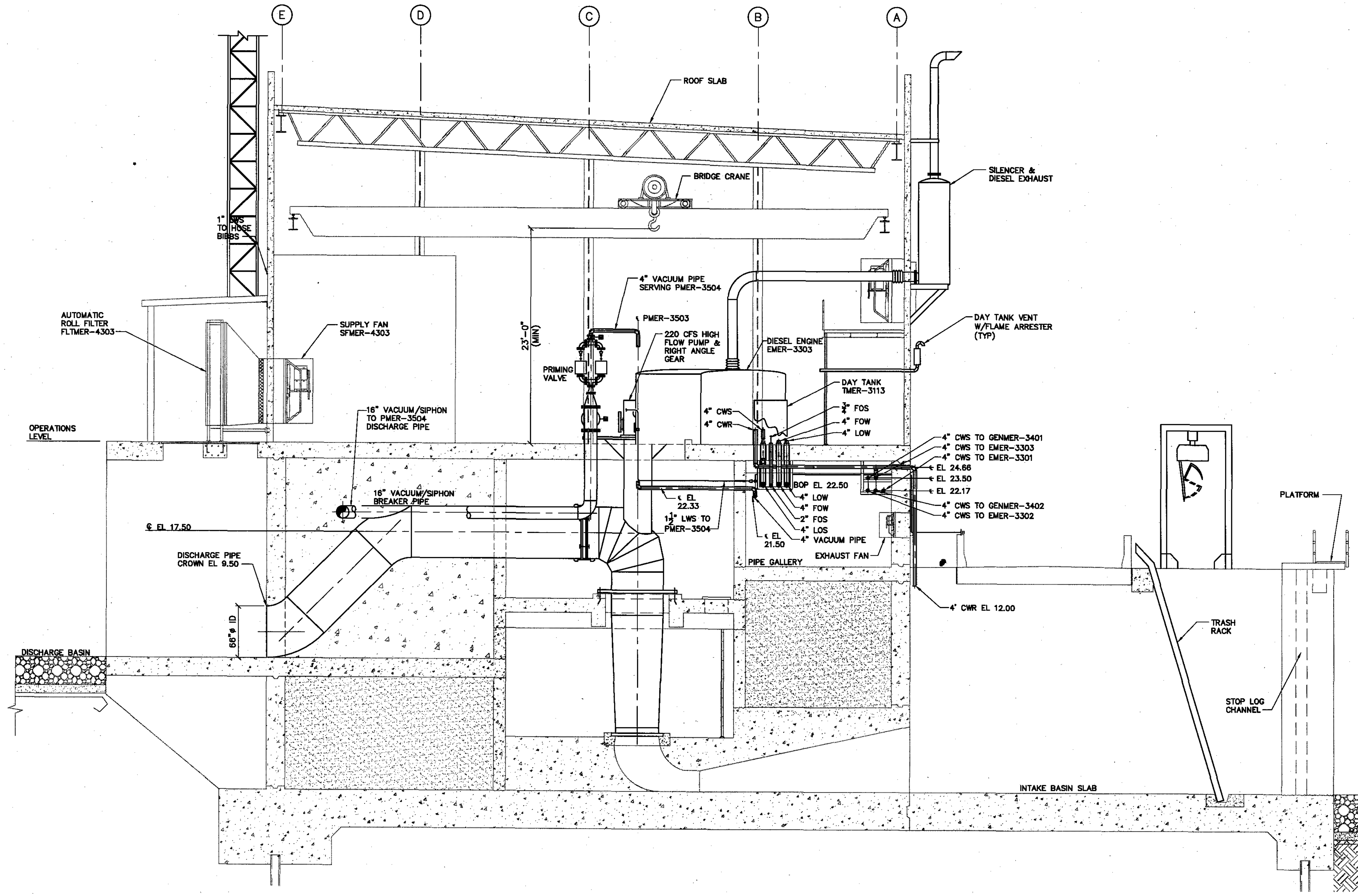
PICAYUNE STRAND RESTORATION PROJECT
MERRITT PUMPING STATION
MECHANICAL
OPERATONS LEVEL PLAN - EL 27.00

M-1



SECTION (B) M311.05 | M321.05 M312.05

4 2 0 4 8

SCALE: 3/16"=1'-0"

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FL. ENGINEERING LICENSE NO.: 58138

DATE	E.O.R.	REV.#	REVISION DESCRIPTION
08/08/09	SAC	0	FOR ADVERTISING

ENGINEER: TJP
DRAWN: WAH
CHECKED: LF
DATE: 09/27/08
SCALE: AS SHOWN

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CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

US ARMY CORPS OF ENGINEERS
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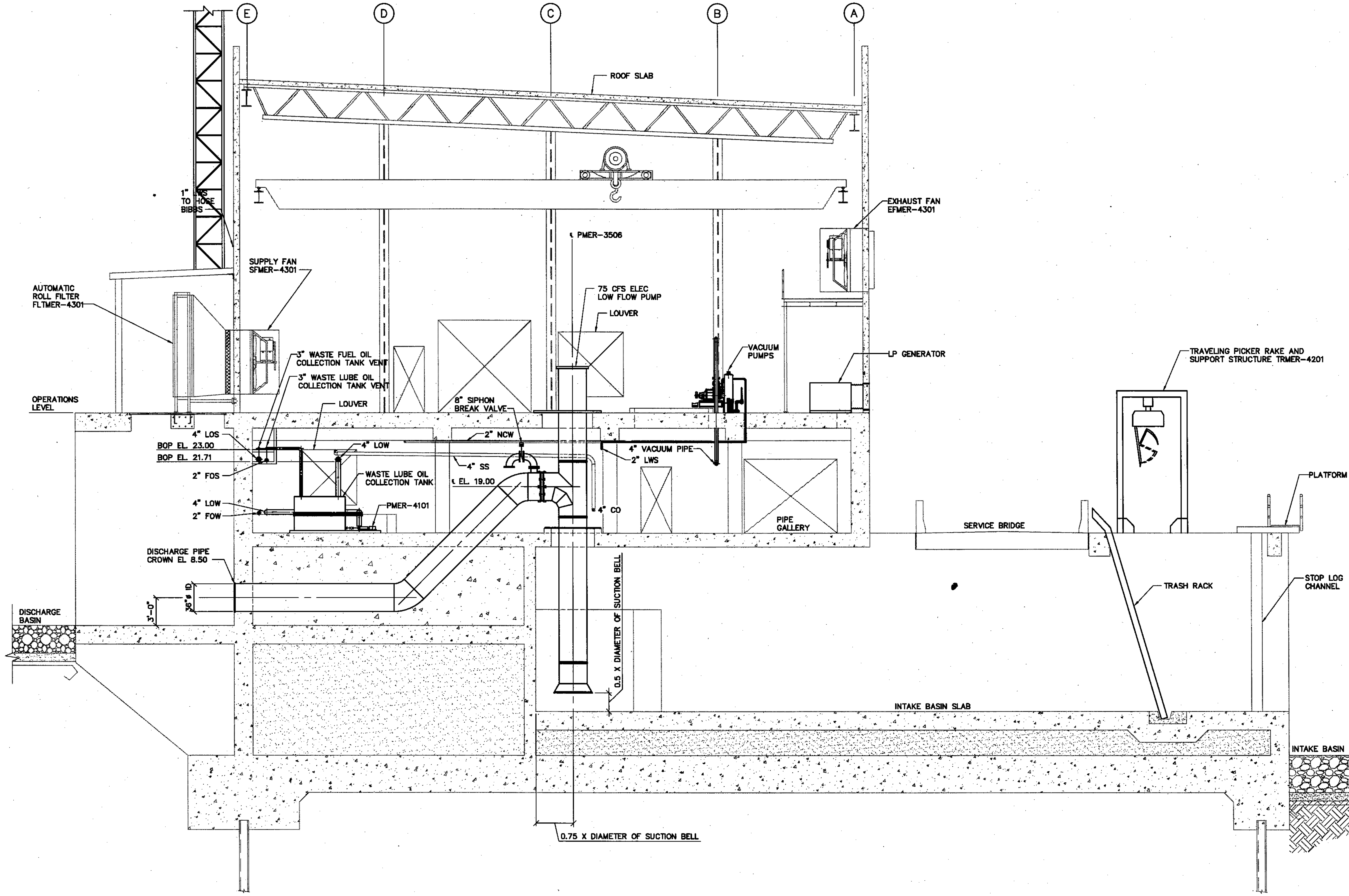
PICAYUNE STRAND RESTORATION PROJECT
MERRITT PUMPING STATION
MECHANICAL
HIGH FLOW DRAINAGE PUMP SECTION

M-2

J:\CADD\746255 - Merritt_USACE\USACE Merritt Comments\DWG REV-2 (ACAD09)\CN040917-3-M2105.dwg - Thursday, July 30, 2009 8:10:44 AM



SECTION C

M311.05 M322.05
M312.05

4 2 0 4 8
SCALE: 3/16"=1'-0"

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DATE:
ENGINEER OF RECORD: Troy John V. Perella, P.E.
FL. ENGINEERING LICENSE NO.: 58138

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DRAWN: WAH
CHECKED: LF
DATE: 12/27/05
SCALE: AS SHOWN

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JACKSONVILLE, FLORIDA

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PICAYUNE STRAND RESTORATION PROJECT
MERRITT PUMPING STATION
MECHANICAL
LOW FLOW DRAINAGE PUMP SECTION

M-3

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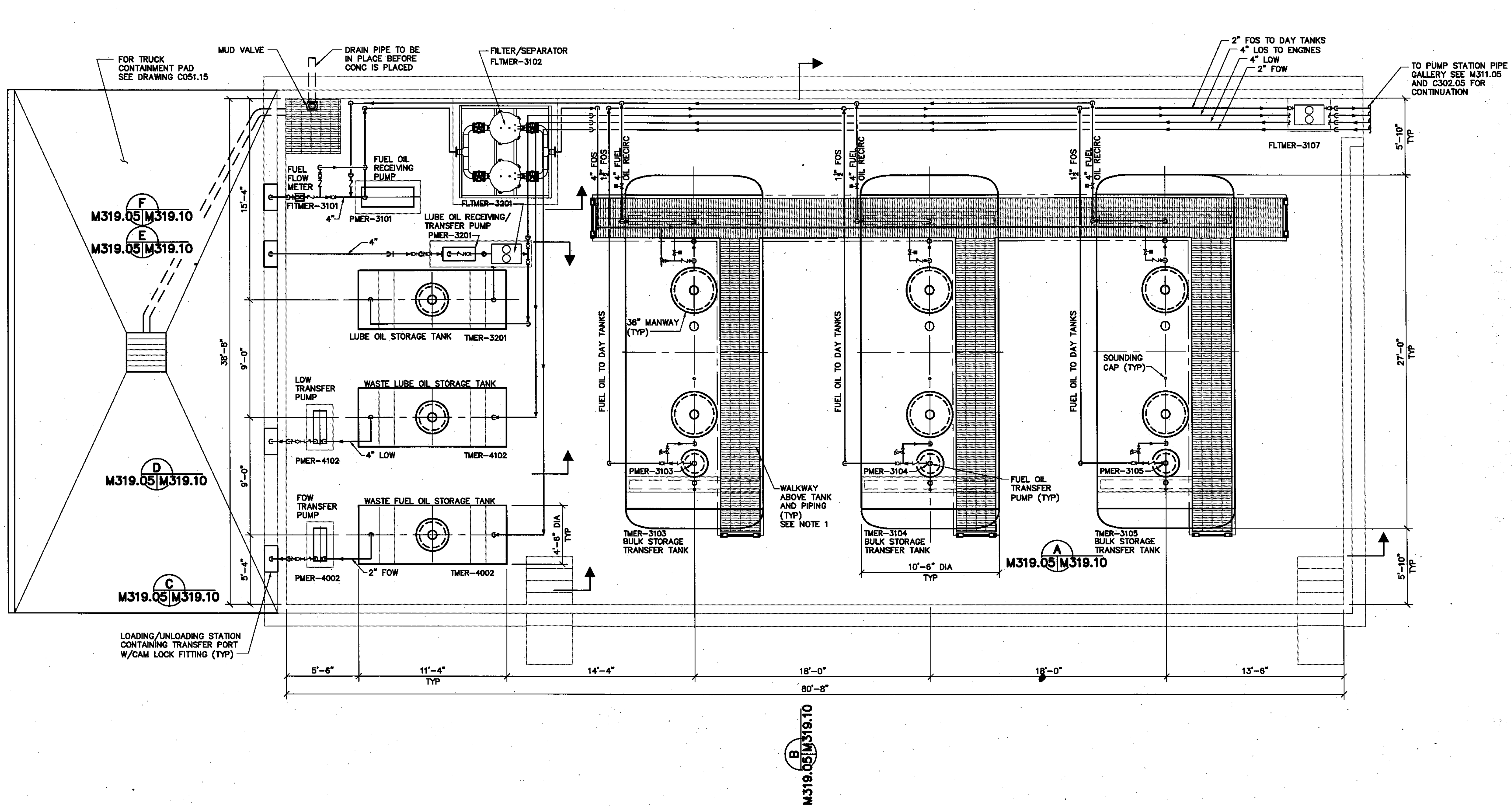

TANK FARM PLAN

SCALE: 1/4"=1'-0"

NOTES:

1. WALKWAY AND TANK SUPPORTS TO BE PROVIDED BY TANK MANUFACTURER.
2. FOR SAFE PASSAGE BETWEEN TANK FARM EQUIPMENT, BOTTOM OF ELEVATED PIPING SHALL BE AT A MINIMUM 7'-6" ABOVE TANK FARM FLOOR.
3. PIPING ADJACENT TO VALVES, INSTRUMENTATION, AND PUMPS SHALL BE INSTALLED AT A LOCATION THAT WILL NOT HINDER MAINTENANCE OR REPLACEMENT OF SUCH EQUIPMENT.

The consultant, contractor or other parties associated with this project shall comply with Florida Statutes 119.07 (6) (e). These plans are the property of the United States Army Corps of Engineers and must be secured and maintained in a confidential manner. Review by any unauthorized individual or outside/third party not performing work necessary for this project is prohibited.

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AUTHORIZATION NO. 9834

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PICAYUNE STRAND RESTORATION PROJECT
MERRITT PUMPING STATION
MECHANICAL
TANK FARM PLAN

DATE	E.O.R.	REV.#	REVISION DESCRIPTION
08/08/08	SAC	0	FOR ADVERTISING

ENGINEER: TJF
DRAWN: WAH
CHECKED: LF
DATE: 05/22/08
SCALE: AS SHOWN

M-4